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THE  
PSYCHOLOGY OF MENTALLY  
DEFICIENT CHILDREN

BY

NAOMI NORSWORTHY, PH.D.

(SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE  
DEGREE OF DOCTOR OF PHILOSOPHY, IN THE FACULTY OF  
PHILOSOPHY, COLUMBIA UNIVERSITY)

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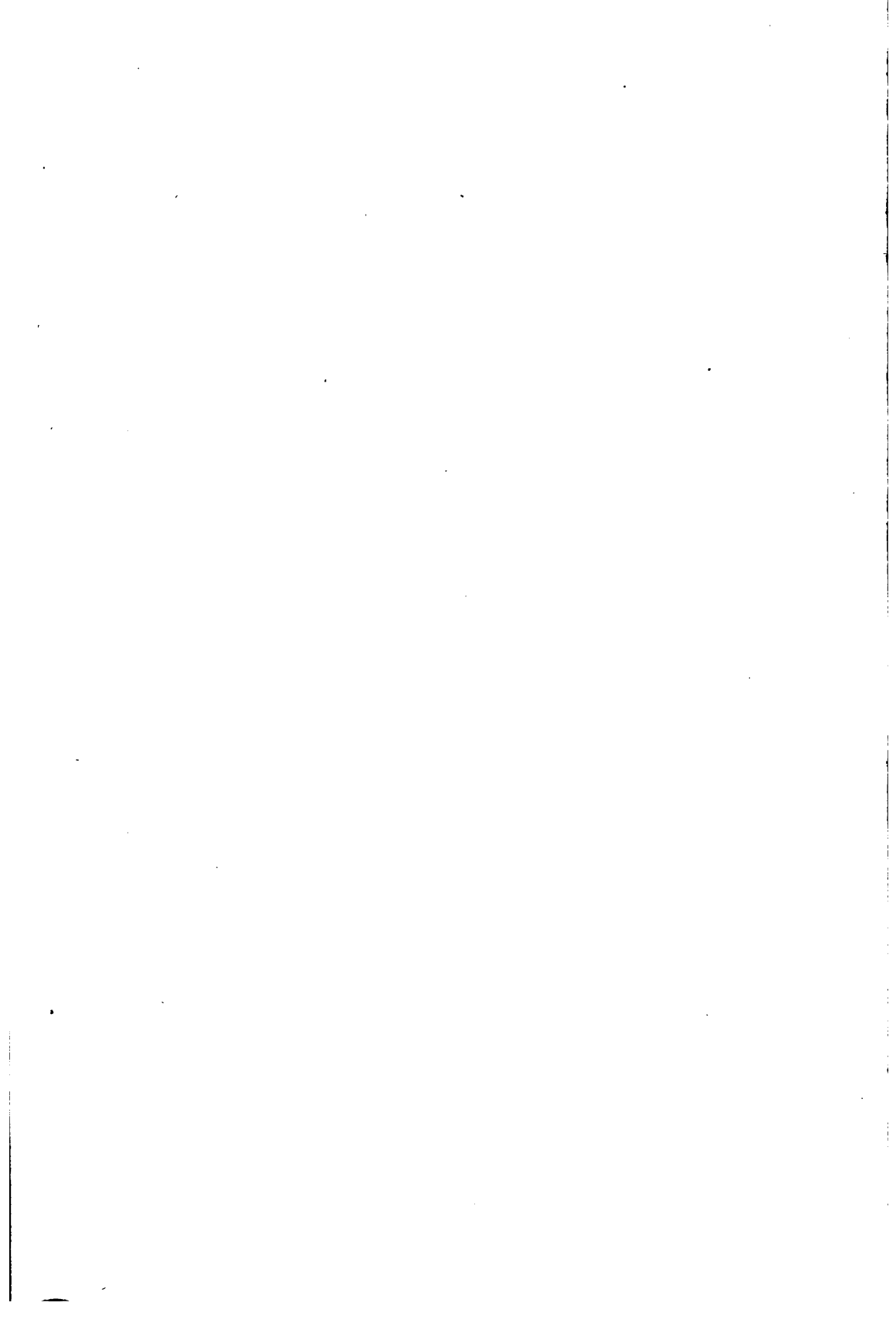


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# THE PSYCHOLOGY OF MENTALLY DEFICIENT CHILDREN

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## § 1. *History of the Interest in Mental Defectives*

MENTAL deficiency has existed and has been recognized as such since the earliest times. We find it mentioned in the legends and historical writings of the most ancient peoples. In those far away times we find that individuals of weak intellect were treated very differently in different nations. Among the Orientals, the Brazilians, the North American Indians and in many parts of Ireland and Brittany, the feeble-minded were considered to be under the special protection of deity, and consequently were treated with all respect and consideration. The Greeks, on the contrary, took the opposite point of view; the mentally weak as well as the physically weak were left to die from exposure.

During the middle ages we find scattered records which seem to show that in some monasteries and nunneries of Europe a few feeble-minded children were cared for in a common sense way. Bonnet and Péreire in their treatment and care of the deaf-mutes were the forerunners and gave the inspiration to those who were interested in the mental defectives. It is not until the nineteenth century, however, that we find either scientific research and inquiry in the field of mental deficiency or any literature at all valuable.

The first publications worthy of note are from the hand of Itard, a French physician. About 1800 some soldiers passing through the forests of Aveyron discovered a boy, more animal than human, whom they brought to Dr. Pinel, of Paris. Upon examination, Pinel pronounced the boy to be an idiot and therefore incurable. Itard took the opposite point of view and contended that the case was not beyond hope. To prove his diagnosis Itard undertook the treatment of this young savage and in 1801 published his pamphlet, *De l'Education d'un Homme Sauvage* which was followed in 1807 by another. These are virtually reports of Itard's methods and theories of the treatment and education of this idiot. We know of the failure of the physician's plans, but his work and suggestions for the methodical treatment of like cases gave the impetus necessary to further work in this same field, and from this time on we find that the education of the feeble-minded attracted much attention in France.

From the reports of the Institute for the Deaf and Dumb in Hartford, Conn., it seems that in 1818 several idiots were received at that institution and subjected to the same treatment as the other inmates, with some hopeful results. In 1824 Belhomme published his views concerning idiocy, which were in brief that it was possible to ameliorate the unfortunate condition of idiots and to furnish them with a sort of education, the degree to which they were capable of benefiting by this education being dependent upon the degree of idiocy. This view was put into execution four years later by Ferrus, who organized a school for idiots at Bicêtre, in connection with the asylum there. In 1831 Falret undertook the same task at the Salpêtrière. In 1834 was opened a private school for idiots in Paris by Voisin. This lasted for only a few years; but Voisin there gained some of the experience which later led to the publication of his book, *De l'idiotie chez les enfants*. In 1837, with the help of Esquirol, Itard began a series of experiments upon an infant idiot and reported his results from time to time.

It is to Edward Seguin that the honor belongs of having created a real method, the 'méthode medico-pédagogique,' for the treatment and education of idiots. In 1866 Seguin published his theories and method in a book entitled *Idiocy and Its Treatment by the Physiological Method*. This method as outlined by Seguin in this work is still followed in general in the education of the feeble-minded.

The essentials of this method are embodied in the following extracts. The necessary conditions for the improvement of imbeciles are that "the treatment be not only hygienic, but moral; that the education be not the putting in action of acquired faculties, which is the education of the common schools, but the development of the functions, of the aptitudes, of the faculties, and of the instructive and moral tendencies." These powers are to be ascertained by physiological and psychological examination of each case, and the process of education then followed is: "(1) The motor power, (2) The senses, (3) The perceptive faculties, (4) By gymnastics of comparison, (5) By gymnastics of invention, (6) Excitement of sentiments and instincts by normal necessities, (7) Special excitation of the faculty of spontaneity, (8) Incessant provocation to regular action, to speaking and to the exercise of the faculties then developed. The aptitudes thus created are then applied to different specialties, according to the fortune, age or position of each individual, care being taken to choose in every case an occupation which will keep in activity the muscular system as well as the mental faculties."

Contemporary with Seguin, Saegert, in 1842, opened a school for idiots at Berlin, and in the same year Guggenbühl established in Abendberg, Switzerland, a school for the education of *crétins*. Both these men followed the physiologic line of training mentioned above. Guggenbühl went still further and in his plantation near Interlaken foreshadowed the colony plan of the large institutions of to-day.

This work at various places on the Continent stimulated interest in England, and in 1846 Miss White opened a school for defectives at Bath. In the course of the next few years, physicians in London became interested in her efforts, and several schools were opened in that city.

In America, attention was attracted to this new field of work by the interest shown abroad, and in 1847 the state legislature of Massachusetts took up the question for debate. In 1848 an experimental school for idiots was established under Dr. Howe. Three years later, after having achieved valuable results, the school was made permanent and became the Massachusetts School for the Feeble-Minded, now at Waverley, Mass. A similar institution was opened by the State of New York in 1851. Several states followed the lead of these two and established state institutions for the care of these unfortunates. Private schools also were opened under the control of eminent physicians. Thus interest has gone on increasing until in 1901 there existed in this country twenty public and twelve private institutions of importance for the education of idiots.

A further definite step in advance has been made in this field since 1899. For years the public schools have been hampered by what we have called 'backward children,' and the method of treatment of this class of children has offered the material for many a dispute. In London, in 1899, this question was brought before the school board, and a committee was appointed to investigate the conditions as existing at that time in the schools. Their report was that at least ten per cent. of the children attending the public schools needed special instruction. These children, many of them not defective enough to warrant the placing of them in an institution, were yet so defective as to be unable to profit by ordinary school instruction. Not only do the children of this type gain very little benefit from the school work, but their presence in the class prevents the normal children from gaining the most from the instruction. In an investigation conducted among California children, W. S. Monroe reached the same conclusions.

Acting upon the report of the committee, the London School Board established 'special classes' in connection with schools in vari-

ous parts of the city to which the backward children between the ages of seven and sixteen could be sent. Special programs were provided for these classes, and the number of children in each was limited to twenty. In this and in every other way the work was adapted to the intellectual deficiencies of the pupils. Some of the children sent to these classes, after having attended for some time, were sent back to the regular school work; others were given up as practically hopeless cases and sent to the institutions. In June, 1899, London had 43 centers comprising 85 such classes with an average attendance of 1,289 children. Philadelphia, Providence, Boston, and in 1903 New York also, have followed the example set by London and provide for children needing special and unique instruction in the public school system.

Besides these special classes inaugurated by some of the large cities, all the civilized countries have by this time undertaken the care of the feeble-minded in a more or less efficient way. In 1904 France had 4 institutions for the care and treatment of defectives; Germany, 25; Denmark, 5; Jutland, 1; Sweden, 33; Norway, 8; Russia, 1; Holland, 1; Austria, 4; Switzerland, 18; Belgium, 9; Italy, 7; England, 13; Scotland, 3; Ireland, 1; Canada, 1; Australia, 2; Japan, 2; and the United States, 30.<sup>1</sup>

## § 2. *Definition and Classification*

As this investigation is of an experimental character it is not necessary to go deeply into the literature on the subject, which is rather extensive and of a purely descriptive character. The standpoint reached by investigators in regard to definition and classification may, however, be mentioned.

The following are samples of the definitions given:

Lord Coke—"An idiot, or natural fool, is one who from his nativity, by perpetual infirmity, is *non compos mentis*."

Old English law defines an idiot as a person of non-sane memory. It says, "It is sufficient to find him so if he has not any use of reason; as if he can not count 20 pence; if he has not understanding to tell his age, or who is his father or mother."

Bourneville—"Idiocy consists of the arrested development either congenital or acquired of the intellectual, moral and emotional faculties, which may or may not be accompanied by motor difficulties and perversion of instincts."

Esquirol—"Idiocy is not a disease but a condition in which intellectual faculties are never manifested or have never developed suffi-

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<sup>1</sup> M. W. Barr, *Mental Defectives*, pp. 71-77.



ciently to enable the idiot to acquire such amount of knowledge as persons of his own age and placed in similar circumstances with himself are capable of receiving. Idiocy commences with life or at that age which precedes the development of the intellectual and effective faculties, which are from the first what they are doomed to be during the whole period of existence."

Seguin—"Physiologically he can not; intellectually he knows not; mentally he wills not."

Blackstone—"An idiot or natural born fool is one that hath no understanding from his nativity and therefore is by law presumed never likely to attain any."

Clouston—"Idiocy and imbecility are conditions of mental enfeeblement resulting from want of brain development before birth or in childhood. The mental faculties were never there, their organ being unfit to manifest them."

Voisin—"The idiot is an individual whose intellectual, sensory and motor faculties are not developed or are abnormally developed in a defective manner or are arrested in their evolution before or some years after birth to a degree which they can not overcome in consequence of chronic lesions of the brain."

Maudsley—"A defect of understanding by reason of some natural incapacity—which no education will overcome."

Eichholz—"General lack of progress is accepted as the cardinal sign of mental deficiency in Germany."

Ireland—"Idiocy is mental deficiency or extreme stupidity, depending upon mal-nutrition or disease of nervous centers occurring either before birth or before the evolution of mental faculties in childhood."

A Report on the Physical and Mental Condition of the Feeble Minded, London—"It manifests itself through a defective or diseased organization, for even when there are no visible defects, the mischief has presumably begun in the brain matter itself. It is frequently indicated by outward physical abnormalities, or an imperfect general conformation of the body with usually shortness of stature."

Lippestad—"All children who are partially or wholly unfitted to profit by the teaching of ordinary schools may safely be classed under the title of Abnormal."

Osborne—"Perhaps the most noticeable characteristic of the truly feeble-minded child is the very childishness or immaturity of its acts, its expressions or its demonstrative desires. In the majority of cases there will be found to exist some physical abnormality, blight or peculiarity that will give a clue to the retarded development of brain and mind."

The following are samples of classifications used:

**Esquirol**—According to the powers of speech.

1. Those individuals using short phrases.
2. Those using monosyllables.
3. Those making cries only.

**Howe**—According to powers of speech.

1. Simpletons, those individuals using simple sentences.
2. Fools, those using single words.
3. Idiots, those using simple sounds.

**Hoffbauer**—According to powers of judgment.

**Seguin**—According to physiological conditions.

1. Profound idiocy, the central organs affected.
2. Superficial idiocy, the terminal organs affected.

**Duncan and Millard**—According to physical defects. Eight classes.

**Voisin**—

1. Complete idiocy, which is absolute idiocy either congenital or acquired.
2. Incomplete idiocy, that which is susceptible of amelioration either congenital or acquired.
3. Congenital or acquired imbecility.
4. Mental debility.

**Piper**—According to the presence or absence of convulsions.

**Sollier**—According to the attention.

1. Absolute idiocy, complete absence of attention.
2. Simple idiocy, weak attention.
3. Imbecility, fickle attention.

**Ireland**—Pathological.

- |                 |                             |                            |
|-----------------|-----------------------------|----------------------------|
| 1. Genetous.    | 2. Microcephalic.           | 3. Hydrocephalic.          |
| 4. Eclampsic.   | 5. Epileptic.               | 6. Paralytic.              |
| 7. Traumatic.   | 8. Inflammatory.            | 9. Sclerotic.              |
| 10. Syphilitic. | 11. Cretinism. <sup>1</sup> | 12. Idiocy of Deprivation. |

**Tuke**—

1. Those who exhibit nothing beyond the reflex movements known as excito-motor.
2. Those whose reflex acts are consensual or sensori-motor, including those of ideo-motor and emotional character.

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<sup>1</sup> As the cause for cretinism has been found to be a lack of certain chemical constituents in the blood, it is possible that idiocy in some of its other forms may be traced to a similar cause. Instead of classifying defectives according to mental traits, or physical symptoms or the kind of treatment needed, from a medical standpoint at least, the most helpful classification might be one based on the 'chemistry of the idiot.'

3. Those who manifest volition—whose ideas produce some intellectual operations and consequent will.

**Kerlin—**

1. Apathetic idiots.
2. Excitable idiots.
3. Low-grade imbeciles.
4. Middle-grade imbeciles.
5. High-grade or first imbeciles.
6. Juvenile insane imbeciles.

**Kraepelin—**

1. Stupid imbeciles.
2. Active imbeciles.
3. Moral imbeciles.
4. Superficial idiots.
5. Profound idiots.

**Barr—**

Asylum care	$\left\{ \begin{array}{l} 1. \text{ Profound idiots } \left\{ \begin{array}{l} \text{Apathetic.} \\ \text{Excitable.} \end{array} \right. \\ 2. \text{ Superficial idiots } \left\{ \begin{array}{l} \text{Apathetic.} \\ \text{Excitable.} \end{array} \right. \\ 3. \text{ Idio-imbecile.} \end{array} \right.$
Custodial life	$\left\{ \begin{array}{l} 4. \text{ Moral imbecile } \left\{ \begin{array}{l} \text{Low grade.} \\ \text{Middle grade.} \\ \text{High grade.} \end{array} \right. \end{array} \right.$
Apprenticeship and Colony life	$\left\{ \begin{array}{l} 5. \text{ Low grade imbecile.} \\ 6. \text{ Middle grade imbecile.} \\ 7. \text{ High grade imbecile.} \end{array} \right.$
Trained for a place in the world	$\left\{ \begin{array}{l} 8. \text{ Backward or mentally feeble.} \end{array} \right.$

### § 3. *Criticisms of the Available Literature*

FROM the definitions and classifications quoted, it is evident that there is great diversity of opinion upon these two fundamental matters of psycho-asthenics. This is but a sample of the confusion and disagreement that is found with reference to almost every other fact mentioned in the literature on the subject. There is very little exact detailed description of the mental or physical make-up of defectives. We find scattered observations of single cases in medical records and the reports of physicians, which are concerned chiefly with causes for idiocy and the accompanying brain conditions, with vague generalizations about defectives as a whole and with few or no facts to support them. The only exact measurements which I have met are

those of Jacobs, Galton, Johnson, Wylie and Kelly, which will be discussed later.

There are several reasons for this condition of affairs. In the first place, writers differ materially as to the cause of idiocy, some maintaining that the condition is due to malformation of the brain, others that it is due to a diseased condition, and still others that it is due to retarded development, the condition being that of an individual reaching a lower stage of development than the normal person. This seems to be a matter of opinion, since the histology of the brain, in different conditions, is as yet very incompletely worked out. Ireland says that "save in the cases of hydrocephalic and microcephalic idiots, the size of the head gives no estimate of the comparative intelligence of the children." And again both Barr and Ireland agree that "mental capacity diminishes with the brain weight if we use large weights; but if we use smaller weights, two or three ounces, for example, we soon find that we can not establish a constant relation between the size of the hemisphere and the amount of mental power shown." However, these opinions do not deal with the structure of the brain. As to the presence of disease, Wilwarth holds that of the brains examined only fifty per cent. were diseased. The only work which truly touches the points mentioned above is that of Hammarberg, published in 1893. This work has not been continued; at least no further work supplementing it has been given to the public. His result rests upon the examination of the brains of nine idiots. He holds that all idiots have fewer cells in the brain than other people, also that the cells are simpler. In some cases this lack of development may be limited to only one part of the cortex. He finds three types of development: (1) Development of the brain becomes impaired in embryonic stage. No development of consciousness or conception is possible. (2) Development of the brain becomes impaired in a higher embryonic stage or in the first year of life. Consciousness and conception are possible, but no higher development. (3) Development of the brain is impaired during the first year or later; one section is most affected, but the whole brain reaches the development of a younger normal child. Consciousness and conception are possible, but no higher station can be reached by the individual.

In the fields of brain histology and physiological chemistry will probably be found the answers to many of the debated points in this subject, but until there has been more research along these lines we can not hope for agreement among writers in general.

A second cause for conflicting opinions has been the fact that idiocy in all its grades has been confused with insanity, and the man-

ner of treatment and the investigations of insanity have been made to serve also for feeble-mindedness. However, this fallacy has been avoided by some of our recent writers and such treatment is not found in the newer books on the subject.

The third reason for the diversity of opinion may be found in the point of view taken by the investigator. The basis for classification chosen may be etiology, symptomatology, pathological anatomy or education, and with this difference in point of view—a difference which must tinge the whole investigation—it is no wonder that we find statements which are even contradictory.

A fourth reason, and to my mind the most important one, is the lack of scientific experiments as to both the physical and the mental traits of the idiot.

#### § 4. *Summary of Previous Experimental Work*

EXPERIMENTAL evidence as to the position occupied by idiots in various mental and physical traits as compared with the position occupied by ordinary children in the same traits, is the only means of definitely answering questions in the psychology of idiocy. From such exact measurements as exist, namely, those of Jacobs, Galton, Johnson, Wylie and Kelly, we get the following facts. Jacobs, when using the digit test in order to ascertain the memory span of school children, thought that his results would mean more could the tests be given over a wider range of intellectual ability; Galton accordingly supplemented his work by giving approximately the same tests to 44 feeble-minded children. The conclusion drawn from this work is simply that none of the idiots attain the normal memory span—the average for the idiots being 4 digits.

In the *Psychological Review* for July, 1903, R. S. Kelly reports a comparative study of psychophysical tests on normal and abnormal children. The tests were given to the children in the elementary school of the University of Chicago and to those in the Chicago Physiological School. "The tests may be divided roughly into three classes. There were the ordinary tests of the senses of hearing, sight, taste, smell, touch and temperature, together with sensitiveness to pain. There was a series of muscular tests involving numerous forms of muscular coordination with special reference to rapidity, accuracy and steadiness of movement and fatigue. And third, a number of tests were made with special reference to prevalent forms of imagery in peculiar types of children, certain emotional reactions, etc." Quoting the results which bear directly on the tests given: "(4) Approximate uniformity of results in psychical reactions is characteristic of healthy consciousness. Inability to secure this

uniformity is at once a sign of a neurotic condition, which if neglected may become permanent. (5) . . . A child of arrested development has a well-developed *automobile consciousness*. He has power of imagery with reference to this machine, visual, auditory and motor, which measured in terms of race development alone would indicate a degree of intelligence far advanced. . . . (7) These tests with both classes of children agree in indicating that touch is a more primitive sense than color. It develops first and maintains its precedence for some years. (How long is as yet undetermined.) (8) Bright colors are generally preferred by these abnormal children. (9) The grosser movements of the body develop before the finer ones. There is greater accuracy and rapidity of movement with the shoulder than with the finger, and this rule is followed by children up to the highest group (tenth) in the Elementary School. (10) There is a uniform increase of ability in motor coordination as the intelligence rises. (12) The lower the intelligence the more prominent the element of fatigue appears. (15) It is quite possible for the simple motor test which discloses the degree of intelligence to be so conducted as to give ethical data as well. (16) The abnormal child is deficient in intensity and not in extent of psychic function."

The main criticisms of these results are two in number. In the first place the author has not treated enough cases to make his results reliable, especially in the case of the defective children. In some of the tests the number of cases tested is not stated and in no instance is the result obtained for more than sixteen children. In the second place the conclusions quoted are often vague and do not seem to grow directly out of the tests.

Probably the most extensive measurements of the feeble-minded have been made by Dr. R. T. Wylie and reported in the *Journal of Psycho-Asthenics* (Vol. IV., No. 3; Vol. V., No. 1; and Vol. VII., No. 1), which I copy almost in full. His measurements of the height and weight of the feeble-minded children taken in their ordinary school clothes are given in the table on the opposite page.

"To study the condition of taste among the lowest grade of feeble-minded children, the author made use of sugar, quinine sulphate, tartaric acid and salt, applying them to the tongue and noticing if the subject gave any indication of a difference. Thirty-five boys and thirty-one girls were tested. Of these eight girls and fifteen boys, or 24 per cent. of all, gave no indication of a difference. Eight boys and eight girls, or 17 per cent. of all, showed a difference for quinine; twenty-one girls and nineteen boys, or 41 per cent. of all, showed a difference for tartaric acid; and fifteen girls and seven boys, or 23 per cent. of all, showed a difference for salt. Thus the

taste for bitter seems to be most frequently absent, while that for sour is most commonly present.

WEIGHT							HEIGHT						
BOYS				GIRLS			BOYS				GIRLS		
AGES	NO.	W. B.	M. V.	NO. G.	W. G.	M. V.	AGES	NO.	H. B.	M. V.	NO. G.	H. G.	M. V.
1	2	6.260	1.45	1	11.340		1	1	700		1	734	
2	2	12.61	2.78	1	9.300		2	2	828	35	1	752	
3	2	12.156	.54				3	2	839	13			
4	2	13.608	2.50	3	14.153	1.27	4	2	931	86	3	939	36
5	3	16.647	1.32	3	16.238	1.50	5	3	979	44	3	992	48
6	7	20.048	2.13	4	16.601	2.22	6	7	1099	76	3	1046	26
7	9	20.184	2.45	6	19.504	1.86	7	9	1136	47	6	1095	66
8	12	24.802	2.77	11	22.634	3.90	8	12	1217	67	10	1168	61
9	16	26.399	2.68	20	25.854	4.04	9	16	1231	48	19	1248	69
10	20	28.304	4.36	14	30.799	8.94	10	18	1303	87	12	1305	135
11	29	31.706	3.13	17	28.257	5.63	11	29	1351	64	15	1315	87
12	26	31.978	5.49	15	33.475	6.35	12	24	1391	64	15	1374	91
13	27	36.106	7.44	20	40.687	8.30	13	27	1414	95	19	1445	70
14	29	43.001	7.20	23	40.778	8.17	14	28	1539	82	20	1442	109
15	22	43.636	9.71	18	41.140	11.02	15	20	1522	91	16	1471	110
16	27	52.118	8.35	22	45.859	8.53	16	27	1550	64	21	1497	113
17	27	50.439	9.84	24	50.394	8.48	17	27	1590	65	24	1506	81
18	19	65.499	10.93	22	50.258	7.26	18	18	1644	52	20	1525	71
19	20	57.741	8.94	20	56.790	8.17	19	20	1665	79	20	1545	64
20	15	62.441	6.71	19	51.437	9.30	20	15	1684	69	18	1538	78
21	16	59.693	7.39	22	53.161	8.26	21	16	1657	60	22	1537	91
22	8	66.860	6.17	22	51.165	8.26	22	8	1718	35	22	1544	79
23	17	59.556	7.76	9	56.064	6.31	23	16	1681	58	9	1558	61
24	6	59.920	8.62	18	54.295	11.20	24	6	1613	80	18	1546	84
25	6	60.146	6.35	18	51.618	8.89	25	6	1657	56	18	1522	102
26	9	56.744	10.70	12	56.245	11.34	26	9	1653	102	12	1566	59
27	5	56.290	6.12	6	63.095	11.16	27	5	1630	87	6	1528	61
28	10	62.823	2.86	14	48.635	8.85	28	10	1690	31	14	1528	79
29	8	60.146	11.16	8	64.229	15.38	29	8	1621	155	8	1528	45
30	4	61.326	9.17	8	61.054	7.39	30	4	1691	66	8	1541	48

NO.—Number of Boys.

W. B.—Weight of Boys.

H. B.—Height of Boys.

Weights are in Kgms.

Heights given in Mm.

NO. G.—Number of Girls.

W. G.—Weight of Girls.

M. V.—Mean Variation.

H. G.—Height of Girls.

“To study this taste of the brightest feeble-minded children, solutions of the above substances were made, and these were added a little at a time to a quantity of water until the subject perceived the proper taste, the tongue being cleaned and dried at proper intervals. From the quantity of taste solution and water taken the strength of the solution tasted could be calculated. Twenty children were tested. For fourteen of these the averages were:

"For sugar, 1.3 per cent., M. V. 0.4, or 1 part to 77; for salt, 0.48 per cent., M. V. 0.19, or 1 part to 208; for acid, 0.41 per cent., M. V. 0.40, or 1 part to 244; for quinine, 0.0177 per cent., M. V. 0.0062, or 1 part to 5,694.

"The strength of solutions for normal people as determined by Bailey and Nichols is for sugar 1 part to 199, for salt 1 part to 2,240, for sulphuric acid 1 part to 2,080 and for quinine 1 part to 390,000. A marked dullness throughout, and especially so for bitter.

"Six of those tested were unable to recognize the taste of one or more of these substances even when used full strength. With two of them salt was wanting, with three of them sour, and with two of them bitter, in every case being identified with another taste.

"Hence, with the feeble-minded, as with criminals, we find a marked dullness of taste. With a few some of the tastes are lacking, while with the lowest grades only one or two may be present.

"The reaction times were taken with a Hipp's chronoscope and the common touch key; for sound an electric hammer was used. The current through the instrument was reversed after each reading. Of those making the test twenty-two—sixteen boys and six girls—were considered to have made the test properly. Their ages varied from eight to thirty-seven years, the average being twenty years. The average number of tests for each was twenty-one. The average reaction time was 0.338 seconds, with a mean variation of 0.08 seconds. The normal reaction time lies between one tenth and two tenths seconds, say 0.148 seconds, and the mean variations can be put at 0.04 seconds.

"In the number of tests made the effects of fatigue and practice seemed to about balance each other. Twelve other children were tested. Of these five were unable to perform the test, and seven of them had an average reaction time of 0.538 seconds, with a mean variation of 0.164 seconds.

"Sixteen children made the tests for sound reaction. The average number of tests was twenty-four. The average reaction time was 0.293 seconds, with a mean variation of 0.085 seconds. The normal time has been found to lie between 0.120 and 0.180 seconds, with a mean variation of 0.022 seconds. However, fifty-three men in the University of Minnesota gave an average reaction time of 0.214 seconds. The reaction time of the insane to sound has been found to vary from 0.200 and 0.340 seconds, with a high mean variation. On being directed to be quick, eleven children, in a series of five tests, succeeded in reducing their reaction time by an average of 0.012 seconds. Five who did the touch reaction tests were unable to do the sound reaction tests.



"Among the children tested there were fourteen Mongols. Of these eight were regarded as having made the tests successfully. Their average touch reaction time was 0.396 seconds, with a mean variation of 0.095 seconds. The average of the other six was 0.570, with a mean variation of 0.160 seconds. Seven of the Mongols performed the sound tests with an average of 0.360 seconds, and with a mean variation of 0.113 seconds.

"In order to test the visual memory of our children the author made use of form, color and letters. For the first, ten forms were cut from card board, the more common geometrical forms as well as some irregular ones being chosen. Two sets were made, one for the child and one for the experimenter. For the color tests, ten colors were selected from Bradley's colored papers, the endeavor being made to get them as unlike as possible, and affixed to cards. For the last test paper letters mounted upon cards were used, the consonants being chosen so as to exclude syllable formation. The child being ready for the experiment, a set of forms, colors or letters were arranged before him on the table; five of the same series were then shown to him by the experimenter for two seconds, as indicated by a metronome, then they were covered from view and the child was required to select the same five as he remembered them from the sets of objects before him, the order of selection being disregarded. Five trials of each sort were made, and the number of correct selections noted. The results were as follows:

	Form	Color	Letters
Girls 26	2.3	2.4	2.5
Boys 25	2.5	2.3	2.7

"Thus out of five objects these were the average number correctly remembered. The ages of the children ranged from fifteen to thirty, and we think that we are not wrong in expecting almost perfect answers to our tests from normal people of the same age. The memory error for five objects of our children is:

	Form	Color	Letters
Girls	2.7	2.6	2.5
Boys	2.5	2.7	2.5

"Grouping the children according to mental ability, as estimated by their teacher. A being the brightest, we have:

	Form	M. V.	Color	M. V.	Letters	M. V.
Boys A	3.3	0.6	3.2	0.5	4.1	0.5
B	2.9	0.3	3.0	0.4	3.2	0.4
C	2.5	0.6	1.7	0.9	1.8	1.0
Girls A	2.9	0.4	3.1	0.5	3.6	0.7
B	2.4	0.4	2.5	0.5	1.8	0.8
C	1.9	0.7	2.0	1.2	2.2	1.6

"Interpreting the mean variation as the uncertainty of memory, and deducing the memory error from the other columns, we see that the error and uncertainty of memory increase with mental dullness. In regard to the influence of the knowledge of the names on the memory of the objects, we find that the average number of names known by each child is:

		Form	Color	Letters
Boys	A	4.5	6.6	10
	B	3.5	5.0	7.8
Girls	A	4.1	8.6	10
	B	2.0	2.0	1.0

This shows a slight influence in colors and letters with the girls.

"The tests so far having to do with visual memory, we next took up for consideration the auditory memory. To this end, we made use of the following tests. First a series of nonsense syllables were made, endeavoring to get some as free from association as possible. These were read to the child at the rate of one per second, five making one test. Next were selected groups of six associated words, which were likewise read to the child at one per second. He was required to repeat them immediately, and both the words remembered and the number of associations were noted. Lastly, groups of sentences were selected from their school readers. These were of various lengths from five to thirty-five words. They were read to the child at the rate of a word per second and he was required to repeat it immediately. The number of words correctly remembered was noted. The results were as follows:

	Syllables	Words	Ass'n	Sentences
Boys	2.1	3.9	1.8	10
Girls	2.1	3.7	1.9	12

"The small number of associations and the large number of words is very noticeable. Chance we consider to be excluded by the method of work of the children.

"Grouping our results according to the mental ability of the children, we have:

		Syl.	M. V.	Words	M. V.	Ass'n	M. V.	Sent.	M. V.
Boys	A	3.0	0.4	5.0	0.2	2.8	0.4	15	3
	B	2.1	1.1	4.0	0.6	1.6	0.7	12	6
	C	1.6	0.8	3.1	0.9	1.4	0.6	7	3
Girls	A	2.5	0.7	4.2	0.6	2.2	0.6	16	5
	B	2.1	1.5	3.5	1.8	2.1	1.2	10	5
	C	0.9	0.5	3.3	0.6	1.3	0.6	5	2

"Here, as above, we find the error and uncertainty of memory increase with the mental dullness. These tests in auditory memory seemed easier to perform than those for visual memory, for four girls

and two boys graded C while being able to perform the auditory tests, could not do the visual tests. Grouping the results to show the average number remembered in each way, we have:

	Auditory	Visual
Boys	2.6	2.4
Girls	2.6	2.5

"This shows practically no difference. Yet five girls and two boys said that they remembered by 'looks,' and seven girls and nine boys by 'name.' However, we have seen some influence from the knowledge of the names in the visual tests.

"The same children were given a test on the memory of muscular movements. A graduated rod was fixed on suitable supports and two adjustable stops or rings were placed on the rod so that any distance could be set off by them. Three distances were used; ten, thirty and fifty centimeters. In performing the test, the child was seated so that one of the stops on the rod was in front of him, the other stop was set at the required distance; with eyes shut, the child then moved the index finger of his right hand from one stop to the other and then back. The outer stop was then removed and he was required to move his hand over the original distance as he remembered it. In the first series this was done immediately, then after a wait of ten seconds, then of twenty seconds. The results for 100, 300 and 500 millimeters were as follows:

	0 sec.	M. V.	10 sec.	M. V.	20 sec.	M. V.
Boys 17	108	8.1	111	10.2	144	19.6
Girls 17	108	7.7	113	15.2	108	14.5
Boys	311	16.5	279	23.6	271	27.6
Girls	287	17.8	282	21.8	277	24.7
Boys	490	18.7	463	33.2	447	31.8
Girls	476	18.1	457	22.4	456	23.1

"The averages found by Scripture for the same distances:

0 sec.	M. V.	10 sec.	M. V.	20 sec.	M. V.
- 1.0	0.9	- 3.1	1.1	- 0.1	1.2
+ to 2.8	to 1.3	+ to 2.8	to 1.7	- to 4.0	to 1.9

"Comparing these results from normal people with the ones we have given, we find the memory error of the feeble-minded to be from two to ten times the normal, and the uncertainty of memory to be from five to fifteen times the normal. The memory error, as with normal people, increases with increased distance while the uncertainty steadily increases. Grouping the results according to mental ability, we have, for 100, 300 and 500 millimeters:

		0 sec.	M. V.	10 sec.	M. V.	20 sec.	M. V.
Boys	A	102	6.1	104	10.3	104	13.9
	B	107	9.5	111	11.7	140	19.8
	C	110	8.9	121	8.4	196	26.2
Girls	A	107	7.6	115	16.4	103	11.9
	B	115	12.6	100	6.0	144	33.8
Boys	A	305	17.2	282	25.4	268	28.1
	B	297	10.3	259	21.5	305	24.6
	C	320	23.3	298	24.0	355	31.8
Girls	A	291	14.2	280	22.4	274	25.8
	B	273	35.7	297	16.8	302	17.0
Boys	A	497	15.3	473	46.8	419	31.9
	B	483	20.9	429	30.5	455	40.5
	C	489	18.9	493	20.2	470	21.3
Girls	A	484	16.8	458	23.1	455	24.2
	B	430	24.1	448	17.0	465	15.2

"As a rule the error and uncertainty of memory decrease with intelligence, the results showing some variations probably due to the number examined."

The chief question with regard to all this work is whether the tests were within the comprehension of the children, whether they really understood the directions. In both the experiments in taste and reaction time it is extremely difficult to make subjects understand just what is wanted, and with the feeble-minded this would be doubly true. In some cases the method used is indicated so roughly that one does not know how much the results mean.

Johnson reports in Vol. III. of the *Pedagogical Seminary* three sets of tests on 72 feeble-minded children—a test of memory span for digits, of motor control and of the time of uncontrolled association of ideas. For the memory test the results are roughly as follows: "Approximately 25 per cent. of idiots reach or exceed the ability reached or exceeded by 50 per cent. of ordinary children. This difference is not much greater than between boys and girls in spelling ability." As Johnson points out, the lack of retentiveness, physiologically speaking, is not a prominent factor in feeble-mindedness. The apparent lack may be due to lack of attention or will power.

In the experiment on motor control, 12 feeble-minded children were tested with the ataxiagraph. They seem in general to be slightly below the average ability in motor control attained by normal children.

The greatest difference was found in the third test, the time for uncontrolled associations. Thirty children were tested, the words used being—house, tree, chair, ship, clock and Fourth of July.

	Average	Slowest	Quickest
For 30 feeble-minded boys,	5.35 sec.	10.70	2.70
For 10 ordinary boys,	2.61 sec.	3.47	2.06

Compared with results obtained by Cattell and Bryant from normal children, the idiots tend to make simple objective (rather than logical) associations. This, then, is the gist of the evidence on the subject and of course the main criticism upon it is that the tests are too narrow to admit of a conclusion as to the mental ability of idiots. The digit test has been felt by many experimenters to be unreliable as a real measure of memory, for in the first place it measures only a very special kind of memory, and that dependent upon mere physical retentiveness, and in the second place the results gained from successive tests upon the same individual have such a wide variability as to render them of little practical value. From the standpoint of method another objection is the fact that these results are comparable with the records of children in general only with difficulty. So although this evidence may suggest the presence of certain differences between ordinary children and defectives in certain abilities, it does not go deep enough nor cover a broad enough field to warrant definite conclusions. I have endeavored, therefore, to add to the work in this field by giving exact measurements of a number of traits, both physical and mental, in defectives, and in such a way that a comparison with the general run of people is possible. The results of such tests will, I think, throw some additional light upon the psychology of mental defectives, but I will postpone any further general statements until I have given the facts themselves.

§ 5. *Statement and Discussion of the Particular Problems of this Research*

I HAVE sought to determine (1) whether the mental defects of idiots are equaled by the bodily, (2) whether idiots form a separate species or not, and (3) whether the entire mental growth is retarded, that is, whether there is a lack of mental capacity all around.

The decision of the best thinkers in this field as to the first and the third questions is pretty clearly shown by the definitions of idiocy quoted earlier in this report. Physical defects are so closely associated with mental deficiency, in the minds of some writers, that we find such defects mentioned as signs of idiocy. "It is frequently indicated by outward physical abnormalities or an imperfect general conformation of the body with usually shortness of stature." "In the majority of cases there will be found to exist some physical abnormality or blight or peculiarity that will give you a clue to the retarded development of brain and mind." "The evidences of constitutional weakness, of slow growth, inferior size, of defects in the formation of palate, teeth, ears, skull, etc., are associated with poor sight and hearing . . . and psychic weakness in all or any respects."

"The idiot, commonly dwarfed and undersized, exhibits those signs of physical weakness which at once betray mental degeneration."

"There is a stunting of the whole physical development; the stature is undersized or even dwarfish . . . the special senses, especially hearing, are blunted. In eighty per cent. of cases the so-called stigmata of degeneration are present (Wildermuth), viz., malformation of the eyes, mouth, nose and especially the lines of the face."

G. Tarbell says that idiots are about two inches shorter and nine pounds lighter on the average than ordinary children of the same age. Dr. Shuttleworth agrees with him in his general conclusion that in physical development they are below what is considered as normal, but does not endorse his actual figures. On the whole, then, the tendency is to consider mental defectives as ill grown, poorly developed individuals.

In the answer to the second question noted, by far the weight of opinion is on the affirmative side and the majority of writers seem to take it for granted and to consider the contrary opinion not worth discussion. The two points of view are represented by the following quotations:

"As the scale of imbeciles ascends, it is found that the condition is evidenced not so much by low obtuseness as by irregularity of intellectual developments. This seems to make the difference between the extreme stupidity of the lowest of the healthy and the highest form of the morbidly depraved type. . . . The two conditions do not merge gradually into each other."—Dr. J. B. Tuke. "We have then in the ascending scale, from imbecility upwards, this irregularity of mental conformation, and then again separated as by a clear line the uniformity of dullness of a low class of the healthy type. . . . Belonging, so to speak, to a separate series is the lowest of the healthy—the dullard."—*Report on Physical and Mental Affections of Children*—London.

Sollier would go still further, for he classifies idiots and considers these divisions as representing entirely distinct and independent classes. He believes that idiocy is a symptom, imbecility a disease, and that they are 'entirely distinct and different.'

"The high-grade imbecile, who is almost normal, while closely approximating the backward or feebly-gifted child, yet differs in that he suffers from absolute defect, which may in a measure be supplemented by strengthening those things that remain to him, but which can never be wholly supplied or restored. His defect is not only limited mental capacity, but the psychic forces are wanting, feeble or backward in quality. . . . The feebly-gifted or backward

child has not crossed the border line and by making haste slowly and avoiding risk of over-stimulation may finally reach the goal open to all normal minds, though by a more circuitous route. He is not a mental defective, but a mental invalid, so to speak."—Barr.

The opposite opinion is held by the following writers:

Seguin says that more than 30 per cent. of idiots and imbeciles put under suitable instruction have been taught to conform to social and moral law and rendered capable of order, of good feeling and of working like one third of an average man. More than 40 per cent. have become capable of ordinary transactions of life under friendly control; of understanding moral and social abstractions; and of working like two thirds of a man. And lastly, from 25 to 30 per cent. come nearer and nearer the standard of manhood, till some of them will defy the scrutiny of good judges when compared with ordinary young men and women.

Ireland writes: "Imbecile children have a complete though weak outline of all the human faculties. In their minds every species of mental operation is performed, though on a small and feeble scale. They may have poor judgment, a weak memory, a feeble power of comparison, a beggarly imagination, a fitful attention, but they do possess judgment, memory, comparison, imagination and attention in varying though in meager proportions, and all these can be educated and increased by exercise."

Galton says: "Analogy clearly shows there must be a fairly constant average mental capacity in the inhabitants of the British Isles, and that deviations from that average—upwards towards genius and downwards towards stupidity—must follow the law that governs deviations from all true averages."

According to his estimates there are 250 eminent men to every million and 280 idiots to every million of population in Great Britain, and so he concludes, "Eminently gifted men are raised as much above mediocrity as idiots are depressed below it."

Thorndike writes: "The ordinary usage of language tempts us to think that children can be divided sharply into normal and abnormal, or into hearing and deaf, or into healthy and hysterical; but ordinary observation should teach us that within the human species sharp lines of distinction rarely correspond to reality. Thus we know that children do not form these separate groups, the bright, the ordinary and the dull, but there are a very few bright, others less so, others still less so, others still less, until we reach the lowest idiots by a gradual passage along the scale of intellect." Here we have the two points of view, one which says that the idiot is one apart by himself, belonging to a special species; and the other which

holds that the mental defective simply falls at the extreme of the low end of normal frequency of distribution, that the idiot occupies something of the same position as the genius does, only at the other end of the scale of human intelligence.

As to the third question, the idiot has certainly been considered as an individual in whom mental capacity in all directions is lacking. The phrases, 'arrested mental development,' 'mental enfeeblement,' 'arrested development of the intellectual faculties,' are scattered rather indiscriminately through the books dealing with this subject. General mental deficiency seems to be the acknowledged characteristic of the intellectual nature of the idiot. "Typically the feeble-minded child is weak on all sides—weak in perception, attention, memory, in power over number and language, in combination, in judgment, in mental endurance, and no less defective in touch, in hand power, in general bodily activity and constitutional vigor."

"This form of defective mental development is characterized by a moderate degree of mental incapacity, which is however of equal prominence on all sides of the mental life; it may, however, involve chiefly the moral field, when it is sometimes called moral imbecility. . . . Idiocy is characterized by a more profound degree of mental incapacity than imbecility."—Defendorf.

"A child, the feeble-minded must ever be by comparison and in competition with normal people, but even a child may be brought to fill acceptably a life of service in his simple sphere, however limited; and in that, by constant exercise, feeble power may be raised to its maximum point and kept there possibly for some years."—Barr.

"In idiots the weakness is general and involves the whole mind." The work which has lately been done on the correlation of mental abilities in normal individuals might tend to make us feel a little sceptical as to this point of view. However, as has been already stated, practically nothing has been done that can be pointed to as a basis for the affirmation or negation of such statements as those just quoted.

It was then to find some reliable answers to these three questions, about which opinions differ so materially, that this investigation was undertaken.

### § 6. Description of the Tests

MEASUREMENTS were taken of the following mental and physical traits:

*Mental Traits.* Efficiency of perception (1 and 2); memory of unrelated ideas (4); memory of related ideas (3 and 14); ability in the formation of abstract ideas (5); ability to appreciate relation-



ships and to control associations (6); perception of weight (13); motor control (11 and 12).

*Physical Traits.* Height (7); weight (8); pulse (9); temperature (10).

In describing the exact nature of these measurements I shall for convenience divide them into those obtained from whole classes simultaneously and those obtained from one individual at a time.

*Class Tests:*

1. Efficiency of perception (rate and accuracy combined): Marking A's.

OYKFIUDBHTAGDAACDIXAMRPAGQZTAACVAOWLYX  
WABBTHJJANEFFAAMEAACBSVSKALLPHANRNPKAZF  
YRQAQEAXJUDFOIMWZSAUCGVAOABMAYDYAAZJDAL  
JACINEVBGAOFHARPVEJCTQZAPJLEIQWNAHRBUIAS  
SNZMWAAA WHACAXHXQAXTDPUTYGSKGRKVLGKIM  
FUOFAAKYFGTMBLYZIJAAVAUAACXDTVDACJSIUFGMO  
TXWAMQEAKHAOPXZWCAIRBRZNSOQAQLMDGUSGB  
AKNAAPLPAAAHYOA EKLNVFARJAEHNPWIBAYAQRK  
UPDSHAAQGGHTAMZAQGMTPNURQN XIJEOWYCREJD  
UOLJCCA KSZAUAFERFAWAFZAWXBAAAVHAMBATAD  
KVSTVNAPLILAOXYSJUOVYIVPAAPSDNLKRQAAOJLE  
GAAQYEMPAZNTIBXGAIMRUSAWZAZWXAMXBDXAJZ  
ECNABAHGDVSVFTCLAYKUKCWA FRWHTQYAFAAAOH

FIG. 1.

GAAQYEMPAZNTIBXGAIMRUSAWZAZWXAMXBDXAJZ  
ECNABAHGDVSVFTCLAYKUKCWA FRWHTQYAFAAAOH  
UOLJCCA KSZAUAFERFAWAFZAWXBAAAVHAMBATAD  
KVSTVNAPLILAOXYSJUOVYIVPAAPSDNLKRQAAOJLE  
AKNAAPLPAAAHYOA EKLNVFARJAEHNPWIBAYAQRK  
UPDSHAAQGGHTAMZAQGMTPNURQN XIJEOWYCREJD  
TXWAMQEAKHAOPXZWCAIRBRZNSOQAQLMDGUSGB  
FUOFAAKYFGTMBLYZIJAAVAUAACXDTVDACJSIUFGMO  
SNZMWAAA WHACAXHXQAXTDPUTYGSKGRKVLGKIM  
JACINEVBGAOFHARPVEJCTQZAPJLEIQWNAHRBUIAS  
YRQAQEAXJUDFOIMWZSAUCGVAOABMAYDYAAZJDAL  
OYKFIUDBHTAGDAACDIXAMRPAGQZTAACVAOWLYX  
WABBTHJJANEFFAAMEAACBSVSKALLPHANRNPKAZF

FIG. 2.

Fig. 1 was given out face downward. After I had ascertained that each child could recognize capital A, they were told that they were to mark the capital A's on the paper, working as fast as they could. At the word of command the papers were turned over and marking began. At the expiration of 60 seconds, papers were turned over, names written and papers collected immediately. The same method was followed with all similar tests. This test was repeated a day or two later, Fig. 2 being used for the purpose (1 b).

2. Efficiency of perception (rate and accuracy combined): Marking words containing both a and t.

#### A.

Dire tengo antipatia senores; esto seria necesidad, porque hombre vale siempre tanto como otro hombre. Todas clases hombres merito; resumidas cuentas, culpa suya vizconde; pero dire sobrina puede contar dote veinte cinco duros menos, tengo apartado; pardiez tamado trabajo atesorar-los para enriquecer estrano. Vizconde rico. Mios, quiero ganado sudor frente salga familia; suyo, pertence, tendran. Conozco marido pueda convenirle Isabel: Carlos, sobrino. Donde muchacho honrado, mejor indole, juicioso, valiente? Quieras sobrino. and 23 lines more of the same general sort.

FIG. 3.

Fig. 3 was given out face downward. The children were told to mark each word containing both of the letters a and t. In two schools the work required was illustrated by samples put upon the blackboard. In the third this was not possible. Two tests were given in this experiment, a similar paper being given upon a subsequent day (2 b). Time allowed, 2 minutes.

3. Memory of related words, 2 tests.

a.	b.
river	school
water	teacher
brook	book
flow	desk
ice	pen
cold	read
winter	write
snow	add
sled	spell
skate	word

The ten words in column 'a' were read, the reading taking about 7 seconds, and then the children were required to write all remembered. As some of the children wrote very poorly or not at all, the writing was done for them by myself and an assistant. Of course we put down exactly what was given by the children. The words in column 'b' were given in the same way. No time limit.

4. Memory of unrelated words, 2 trials.

a.	b.
red	long
dog	green
buy	arm
day	inch
never	dress
sing	run
boy	true
sick	knife
tree	break
can	friend

Same method as in No. 3.

5. Ability in the formation of abstract notions. Noun test.

book	she
read	desk
one	black
hat	good
doll	stone
play	ring
if	dress
cup	run
ball	dish

The children were told to mark every word that was the name of a thing. In order to make sure that the directions were understood, they were first asked whether or not they would mark the following words: book, play and school. There was no time limit for this test.

6. Ability to appreciate relationships and to control associations, measured by the three following tests:

## A. Opposite test:

I.	II.
bad	good
inside	outside
slow	quick
short	tall
little	big
soft	loud
black	white
dark	light
sad	happy
true	false
dislike	like
poor	rich
well	sick
sorry	glad
thick	thin
full	empty
peace	war
few	many
below	above
enemy	friend

The children were told they were to write beside each word a word that meant just the opposite to it,— meant 'just what the word you see does not mean.' Correct answers were first elicited to the following examples: bad, long and well. In the second test, which was given on a subsequent day, no samples were given. Time, 60 seconds.

## B. Part-whole test.

door	nose
pillow	cover
letter	page
leaf	engine
button	glass

The directions here were to write beside each word the name of that whole thing of which the given word is a part. Examples given were the words nose (face), button (dress, etc.), room (house, etc.). No time limit.

C. Genus-species test.

book	dish
tree	boat
room	game
toy	plant
name	fish

The directions were to write down the name of some particular thing, the class name of which is given. The words used as examples were name (John, etc.), dish (cup, etc.), tree (oak, etc.). No time limit.

*Individual Tests:*

7. Height. Taken standing in their shoes.
8. Weight. Taken in ordinary clothing.
9. Pulse.
10. Temperature. Taken at the mouth before and after the following series of tests.
11. Accuracy of movement.

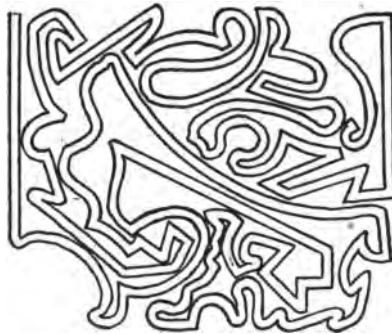


FIG. 4. Maze Test.

The children were told to draw a line between the two lines of the maze in Fig. 4 without touching either and to work as fast as they could. The lines were 2 mm. apart, the entire maze being 125 mm. by 106 mm. Two tests were given for a time limit for each of 2 minutes.

12. Test of form perception and rate of movement.

A board 42.5 cm. by 30.5 cm. and 2 cm. thick had holes of the shapes shown in Fig. 5 cut in it to a depth of 8 mm. Blocks provided with convenient handles and fitting snugly into these holes were placed beside the board. The child was told to fit each block into

its own proper hole as fast as possible, after having watched it done once. A second trial was allowed after a considerable interval. The time taken was noted in seconds.

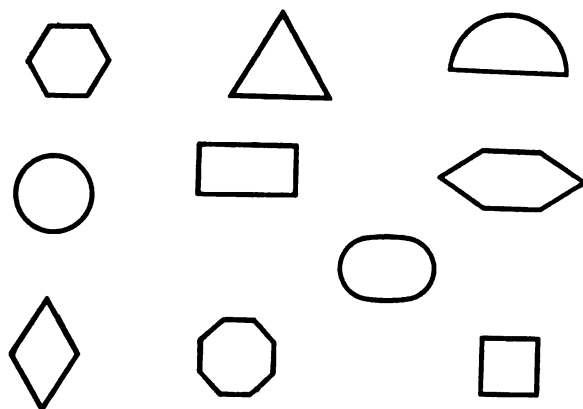


FIG. 5. The Block Test.

13. Test of perception of weight.

a. A wooden box containing shot and weighing 100 gms. was taken as the standard and the child was told to fill a similar empty box with shot until the two boxes weighed alike. Two trials were made.

b. In the other part of this test the second box was filled with shot and the child was required to take out shot until the weight of the two were equal. Here also two trials were given.

14. Semilogical memory. Tested by giving the following simple dictations:

- a. I have one head, two eyes, two hands and ten fingers.
- b. I sit in my seat. I read from a book. I write with a pencil.
- c. One and two are three. Three and four are seven. Five and six are more than ten.
- d. In the morning I go to school. After school I play. At night I go to bed.

Each of the four dictations was read slowly once and after each reading the child was required to write all he could remember.

15. The class tests numbered 5 and 6A were repeated with the individual children, the differences in the administration being that in this case there was no time limit and that each child received all necessary assistance as to the spelling of words, etc.

The tests were given in the School for the Feeble-Minded at Waverley, Mass., the Institution for the Feeble-Minded at Lakeville, Conn., and in the classes for defectives in one of the New York public schools. The total number of children tested in any trait

was one hundred and fifty-seven, the majority being between eight and sixteen years of age.

The class tests were given to all the 'school cases' in the institutions save those in the kindergarten, that is, to all those children who were considered bright enough to gain any good from definite instruction and so were sent to the school of the institution. From among these 'school cases' the brightest children were selected and were given the individual tests as well. In the New York school practically all the children in the special classes took both sets of tests.

The tests were given in exactly the same way each time, written directions being memorized and repeated verbatim on each occasion of testing, thus eliminating possibilities of error in results due to differences in directions. Special care was given to this side of the work, as in a former test one class of children did half as well again as another class of equal grade because in the two classes there had been a slight difference in the giving out of the directions.

### § 7. *Probable Sources of Error*

ALTHOUGH all possible care was taken to eliminate the possibilities of error from the experiments (1) by selecting such tests as were not too far above the capabilities of the feeble-minded as to yield no result and yet not so far below the ability of normal children as to yield perfect scores, and (2) by having the conditions of the test as nearly alike in all cases as possible; yet there were several occurrences which may be sources of error and as such should be noted.

1. The a-t test did not always measure efficiency of perception in the defective children because of their inability to understand the directions. Out of 68 feeble-minded children, 28, or 41 per cent., misunderstood the directions and either marked the words containing either a or t, or marked the letters a and t. Among 159 normal children under twelve years of age only 13, or roughly 8 per cent., misunderstood. Of course the fact that the defective children failed to do the test as required tells us something about their general mentality and ability to understand simple directions, but as a test of efficiency of perception I consider it too subject to ambiguity to be of general service.

2. Because of physical deformities and lack of training many of the children wrote very slowly and laboriously and some could not write legibly at all, so that often the writing had to be done for them. In the tests for memory of words and the dictation, this fact offers a source of error, for the child who received assistance first had of course a very much greater chance of remembering more and

remembering correctly than the one reached second or third. This difficulty was partially obviated by the fact that we did not assist the same child first every time. As there were four sets of words in the memory test and four simple dictations we had the opportunity of scattering the help so that the result is as fair as possible.

3. Another source of error may rest in the difficulty that was found in the 6th test in making the word 'opposite' clear to the children. In the class tests only the directions noted above were given, but when the same test was given to the individual children it was often found necessary to say, 'If he isn't sick, what is he?' 'This is long, another might be what?' etc., in order to gain any understanding of the test. It might be claimed that this was not fair, but as the same method was followed with all the children tested, both normal and abnormal, the results are not vitiated. The test in this case was of the ability to appreciate relationships and control associates, not of ability to understand directions, and if the directions could be made clear by any means it was legitimate to adopt those means. A comparison of the same test given in class when no such assistance was given with the one given to the children individually, proves that a great part of the deficiency in the first was due to simply a lack of understanding of the directions.

4. In several instances the temperature as recorded is not reliable (all such cases have, therefore, been marked with an asterisk). This probable error is due to the fact that those children in the case of whom the doubt is felt, were mouth breathers and consequently were not able to keep their mouths closed during the two minutes of the taking of the temperature. In one or two cases the children succeeded much better when the temperature was again taken at the close of the hour.

So far as I am aware these are the only noteworthy sources of error. No one of them is large enough to vitiate the results in any way, but in these particulars the administration of the tests might be improved.

#### § 8. *Actual Marks gained by the Defectives in the Different Tests*

THE actual results from these tests, *i. e.*, the marks gained by each child in each measurement, are given in Tables I. to V. inclusive.<sup>1</sup> Figures in italics represent records of boys, and the others represent girls. An 'F' in any record means that the individual failed in the test owing to inability to understand the requirements

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<sup>1</sup> The tests were all graded by the same person, who followed a definite standard for the correctness or incorrectness of the results of any measurement. The keys used may be seen in Section 19.



or for some other reason. An F may mean a blank paper, or it may mean that the whole thing was done incorrectly. For instance, in the a-t test any child who marked all the individual 'a's' and 't's' instead of the words containing the letters a and t was marked F. A few words of explanation will serve to make the tables clear.

Table I. The first column designates each individual by a number—each child retaining the same number throughout the tables, so that the dropping of a number means that that person did not take those tests. The second column states the individual's age in years and months. An interrogation point means that only the year and not the month of birth could be ascertained. The third column gives the height of the children in centimeters. The fourth column gives the weight—that of boys being given in kilograms and that of the girls in pounds. The fifth column gives the number of A's marked in sixty seconds in test 1a and the sixth column the number marked in the same time in test 1b. The seventh and eighth columns give the number of words containing a and t marked in two minutes in tests 2a and 2b respectively. No. 20's record reads: age 13 years 1 month, height 144 cm., weight 95.4 lbs. First A test marked 35, second A test marked 50, failed in both a-t tests.

Table II. The first column gives the number of each child. The second column gives the number of nouns marked correctly, and the third column the number of mistakes made in test 5. The fourth and sixth columns state the number of words remembered in tests 4a and 4b, and the fifth and seventh columns state the number of words put down as remembered which had not been read in those tests. The eighth and tenth, the ninth and eleventh columns show the same for tests 3a and 3b.

Table III. The first column—as before. The second column shows the number of words to which an 'opposite' was correctly written in test 6AI., and the third column the number of incorrect 'opposites' written in the same test. The fourth and fifth columns show the same results for test 6AII. The sixth column gives the number of correctly named particulars which were written after the class names in test 6C, and the seventh column the number incorrectly named. The eighth and ninth columns state the same results for the part-whole test, number 6B.

Table IV. The first column—as before. The second column states the pulse rate for one minute. The third and fourth columns respectively state the child's temperature in degrees and tenths of a degree, taken before and after an hour's mental work. The fifth and sixth columns state the number of seconds taken by the child in two trials in putting the blocks in their places in test 12. The last

four columns tell the number of shot too many or too few, as indicated by the signs, put into the box in four successive trials in test 13.

Table V. The first column—as before. The second and fourth columns indicate the number of units of amount covered in two trials with test 11. The third and fifth columns show the number of touches made by the children in those trials. The sixth, seventh, eighth and ninth columns show the results of tests 6A1. and 5 when repeated with the individual children and without a time limit. The last four columns state the gradings received in the four dictations given in test 14.

*Note.*—Nos. 51, 80, 82 and 94 were considered to be moral idiots and their records may be found at the end of each table. These records have not been used in my results, for as there is some difference of opinion as to whether these idiots are intellectually as well as morally defective, it might be maintained that they are on a different intellectual level from the rest of the defectives.

TABLE I.

No.	Age.		Ht.	Wt.	A.	A.	s-t.	s-t.
	yr.	m.	cm.		1st.	2nd.	1st.	2nd.
1	12	2	150	75.0	34	44	10	6
2	10	1	115	69.9	8	26	2	3
3	9	4	112	43.7	24	36	16	6
4	8	5	111	46.6				
5	9	11	118	45.5				
6	12	11	128	59.1				
7	14	5	143	77.6				
8	9	5	122	52.1				
9	9	5	125	63.3				
10	12	5	154	81.6	31	45	12	7
11	8	5	127	59.1	24	30	9	2
12	11	8	122	47.0	F	F	F	F
13	8	11	127	57.6	29	40	10	7
14	8	2	120	52.5	19	30	10	6
15	10	3	142	89.0	30	48	18	F
16	9	10	117	53.0				
17	8	5	117	51.2	24	40	10	7
18	12	10	146	92.3	47	45	10	9
19	9	6	129	67.7				
20	13	1	144	95.4	35	50	F	F
21	11	10	142	73.7	19	27	8	6
22	7	11	114	47.7				
23	12	7	141	86.6	43	58	19	9
24	12	6	141	69.7	37	48	8	4
25	11	4	137	71.9	32	43	10	9
26	10	0	124	57.8	38	44	12	8
27	11	7	135	72.8				
28	9	0	121	52.5	21	28	9	5

MARKS GAINED BY DEFECTIVES

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No.	Age.		Ht.	Wt.	A.	A.	a-t.	a-t.
	yr.	m.	cm.		1st.	2nd.	1st.	2nd.
29	12	0	137	73.0				
30	11	2			37	47	1	5
31	8	9	121	44.0	28	43	10	6
32	8	10			20	41	17	9
33	8	2	123	49.7	41	42	6	2
34	12	1	130	61.8	27	45	13	6
35	12	8	152	101.0	49	56	21	12
36	12	5	129	58.7				
37	11	2	125	57.1				
38	13	0	146	89.7	46	59	18	7
39	10	10	142	81.4	34	48	10	6
40	8	7	116	51.7				
41	12	0	138	72.8				
42	11	0	137	30.5	32	53	7	4
43	20	?	136	96.5	2	F	F	F
44	14	0	138	104.0	50	75	F	F
45	22	0	163	49.1	9	29	F	F
46	11	0	115	20.6	F	F	F	F
47	13	0	145	37.8	40	58	10	9
48	15	0			31	44	F	F
49	17	?	164	58.7	50	80	8	3
50	22	?	151	96.0	F	10	F	F
52	21	?			F	F	F	F
53	14	0	171	55.1	30		12	
54	14	0	138	34.6	75	83	14	11
55	10	?	131	29.1	17	62	5	5
56	13	0	159	43.7	24	25	F	F
57	14	0			97	94	5	F
58	19	?	149	103.0	46		F	
59	16	0	145	46.7	32	54	F	F
60	29	0	175	55.1	65	75	2	F
61	16	0	154	82.5	21	22	F	1
62	18	1	170	66.8	34	44	11	11
63	13	4	142	39.6	22	27	F	F
64	12	11	135	82.0	17	20	F	F
65	12	9	145	79.0	15	12	F	7
66	14	4	135	28.2	17	34	4	8
67	12	1	147	37.8	15	19	F	32
68	16	3	159	98.0	27	39	4	F
69	14	0	160	11.4	14	44	4	10
70	15	1	152	34.6	F	32	12	F
71	13	11	151	46.6	52	46	F	F
72	15	2	163	50.1	27	27	F	F
73	14	3	158	42.8	14	26	5	5
74	11	11	154	41.0	51	50	F	F
75	14	3	140	36.1	50	47	F	F
76	13	9	153	43.3	19		2	
77	17	7	149	41.6	4	26	F	F
78	17	1	164	53.3	26	39	8	4
79	15	2	154	41.1	41	38	6	F

No.	Age.		Ht.	Wt.	A.	A.	a-t	a-t
	yr.	m.	cm.		1st.	2nd.	1st.	2nd.
81	12	4	144	72.0	46	53	21	13
83	16	1	160	13.3	44	59	17	12
84	16	2	161	46.7	27	40	F	F
85	13	11	119	22.7	28	28	F	F
86	13	2	142	35.5	33	46	17	F
87	14	0	158	43.3	24	34	F	F
88	13	9	138	70.5	29	37	4	9
89	13	10	149	79.0	19	35	8	6
90	15	1	158	128.0	23	46	9	F
91	12	5	136	32.3	33	36	F	F
92	12	4	138	70.0	47	44	F	6
93	16	1	160	100.0	37	33	2	3
95	19	11	169	56.9	31		6	
96	16	7	166	59.2	35		2	
97	17	6	157	51.9	17		9	
98	17	1			32	48	9	12
99	8	6	114	44.5	F			
100	12	9	124	30.5	31		2	
101	13	9	152	40.1	26	43	F	F
102	13	0	143	95.0	18			
103	20	0	145	103.0	32	32	4	8
104	16	7	156	118.0	25	19	F	F
105	20	1	156	123.0	23	32	F	F
106	13	11	134	72.0	15			
107	19	6	163	129.0	62	70	11	6
108	12	7	143	36.9	36	43	F	F
109	12	0	142	40.1	17		7	
110	13	5	133	31.4	24		22	
111	15	9	145	80.0	18		8	
112	13	3	158	92.0	17	29	3	1
113	8	3	140	104.0	17	26	F	F
114	8	0	133	34.1	30		F	
115	13	7	109	24.6	18	25	F	F
116	19	1	155	122.0	39	48	2	7
117	8	3	110	41.0	16			
118	17	4	154	137.0	15	63	15	F
119	12	0	145	42.8	7	11	1	3
120	16	6	141	80.0	28	29	11	F
121	15	3	158	50.6	7	28	F	F
122	17	3	168	49.6	14		2	
123	12	7						
124	12	5	152	38.7				
125	18	7	149	84.5	24	43	6	1
126	6	0	119	49.0	15			
127	12	11	153	101.0	58	55	9	4
128	16	9	166	53.7	34	45	F	F
129	16	8	163	112.0	19	46	3	3
130	19	1			59	59	F	11
131	15	2				18		6
132	19	2	156	109.0	22	29	6	F

# MARKS GAINED BY DEFECTIVES

33

No.	Age.		Ht.	Wt.	A.	A.	a-t.	a-t.
	ysr.	m.	cm.		1st.	2nd.	1st.	2nd.
133	12	1	130	29.1	10	11	5	4
134	14	5	139	36.1	17	19	F	F
135	15	6	148	38.7	38	46	22	F
136	17	4	161	107.5	21	31	F	
137	18	4	148	105.0				
138	8	0	133	41.0	71		3	3
139	16	0	152	53.7				
140	12	0	147	43.2				
141	9	7	116	25.1				
142	8	0	115	49.0				
143	15	0	152	40.1	19			
144	9	0		32.3	15			
145	9	0		37.6	26			
146	11	0		34.1	13			
147	16	0	162	47.8				
148	20	0	147	42.8	F			
149	18	0	150	101.0				
150	12	0	129	26.1	29			
151	12	0	147	35.1				
152	9	7	130	27.4				
153	9	0	118	54.0				
154	12	0	139	57.0				
155	8	0	118	44.0				
156	8	0	109	35.0				
157	10	0	132	62.5				

## Moral Imbeciles

51	10	0	131	30.5	79	62	1	5
80	15	1	153	37.8	64	60	23	17
82	11	9	139	30.5	37	47	F	F
94	10	0	143	32.1				

TABLE II.

No.	Nouns.		Unrelated Words.				Memory.		Related Words.			
	R.	W.	R.	W.	R.	W.			R.	W.	R.	W.
1	6	3	6	0	6	0			5	0	3	1
2												
3	6	5.5	2	7	3	6			3	6	1	9
4												
5												
6												
7												
8												
9												
10	9	.5	6	0	2	3			4	1	0	3
11												
12												
13	10	2	4	1	6	1			7	1	3	6

34. *PSYCHOLOGY OF MENTALLY DEFICIENT CHILDREN*

No.	Nouns.		Unrelated Words.				Memory.		Related Words.			
	R.	W.	R.	W.	R.	W.	R.	W.	R.	W.	R.	W.
14	6	0	5	0	5	1	6	0	7	1		
15												
16												
17	7	3	7	0	6	0	5	0	6	1		
18												
19												
20	6	1.5	4	1	3	2	6	0	3	3		
21	F		6	1	3	7	6	3	1	1		
22												
23	10	0	6	4	8	0	8	0	6	0		
24	F		6	3	4	0	6	5	5	1		
25												
26	5	0	5	0	2	0	5	1	2	1		
27												
28	4	2	F		F		F		F			
29	1	3			1	0						
30			F		2	0	3	0	4	0		
31	F		6	2	3	1	6	3	3	2		
32	9	0	6	3	5	0	7	0	4	4		
33	6	1.5	3	2	3	0	4	0	3	0		
34	9	5	4	0	5	0	6	0	4	0		
35	10	0	7	0	5	0	5	1	4	0		
36												
37												
38	8	4	8	0	6	0	5	0	6	0		
39	10	7	6	0	7	3	4	2	4	0		
40												
41												
42	5	0	2	0	1	1	1	2	F			
43	F		F		F		F		F			
44	10	0	6	0	3	0	5	0	4	0		
45	5	0	5	0	4	0	3	1	3	0		
46	F											
47	7	2	7	1	5	1	3	0	3	0		
48	6	0	6	0	6	0	4	1	5	0		
49	9	0	8	0	6	0	6	1	5	0		
50							4	1	1	1		
52			F		F		F		F			
53												
54	9	0	4	0	5	0	4	0	3	0		
55	F		2	0	2	0	4	1	1	0		
56	F		1	0	3	0	2	0	1	0		
57	8	5	F		F		2	5	F			
58	10	0	1	0								
59	10	2	6	0	7	0	3	1	3	0		
60	5	0	6	4	6	2	4	8	2	9		
61	F		F		F		F		1	2		
62	10	0	7	1	8	2	7	1	6	2		
63	6	6	5	2	5	7	5	4	1	2		

No.	Nouns.		Unrelated Words.				Memory.	Related Words.			
	R.	W.	R.	W.	R.	W.		R.	W.	R.	W.
64	F		5	0	5	0		4	0	2	0
65	5	2	4	0	5	1		1	0	1	1
66	8	3	2	0	1	0		3	0	4	0
67	6	3	4	0	4	2		5	1	3	1
68			5	0	6	0		6	0	2	0
69	10	2	7	1	6	1		3	3	1	4
70	8	0	3	1	3	1		7	0	1	2
71	F		4	0	5	2		2	1	2	2
72	9	0	8	1	7	3		3	2	3	2
73	8	2	3	0	4	0		3	2	2	2
74	10	0	7	0	5	2		3	1	5	1
75	6	1			5	0		2	1	2	0
76	4	2									
77	5	5	3	1	6	0		3	2	2	1
78	7	1	7	1	7	0		5	0	3	3
79	10	4	6	0	7	2		4	1	4	2
81	10	1	6	0	7	0		5	0	4	1
83	10	0	9	1	9	1		7	3	6	1
84	6	2	3	0	4	0		5	1	3	0
85	9	1	6	0	5	0		4	1	3	0
86	5	2	6	0	5	2		5	0	2	2
87	F		5	0	5	1		5	1	2	2
88	8	2	6	0	7	0		5	2	5	0
89	7	4	6	1	6	4		3	6	1	3
90	F		5	0	6	0		4	1	3	2
91	10	6	5	0	3	0		4	2	3	0
92	9	1	5	0	5	2		4	2	5	0
93	F				4	3		3	2	2	0
95	9	1									
96	8	0									
97	10	2									
98	10	1	7	0	6	0		5	1	5	1
99											
100	6	3									
101	F		3	0	5	1		3	1	2	1
102											
103	F		6	0	7	0		4	2	2	2
104	7	2	4	1	2	0		4	0	2	0
105	F		3	1	4	1		6	1	3	0
106											
107	10	0	9	0	7	1		7	2	7	0
108	F		5	0	4	4		3	1	3	4
109	F										
110	F										
111	2	2									
112	F		1	1	3	0		3	0	3	0
113	F		5	0	7	1		3	3	2	0
114	F										
115	9	0	4	2	4	1		3	2		

No.	Nouns.		Unrelated Words.				Memory.		Related Words.			
	R.	W.	R.	W.	R.	W.			R.	W.	R.	W.
116	F		6	0	6	0			4	3	4	1
117												
118	10	1	8	0	8	0			6	2	5	1
119	3	2	3	0	1	0			2	0	2	0
120	6	1	2	0	3	0			3	1	2	1
121	6	3	1	1	5	0			2	1	3	1
122	F											
123												
124												
125	5	0	5	1	7	0			6	0	3	3
126												
127	10	5	4	0	7	0			6	0	3	0
128	7	2	7	2	8	1			5	2	6	1
129	5	1	4	1	6	1			6	2	2	3
130	10	0	9	0	6	0			8	0	6	0
131			3	1	3	0			3	0	2	0
132	10	5	6	0	6	0			4	3	4	6
133	F		3	0	4	1			2	1		
134	6	5	4	0	5	0			2	1	1	1
135	10	5	10	0	8	0			7	1	5	0
136	10	2	6	0	6	0			4	1	4	1
137												
138	F											
<i>Moral Imbeciles</i>												
51	1	0	3	0	2	0			3	1		
80	10	1	6	2	6	2			3	2	7	2
82	10	2	6	0	6	1			7	1	5	1
94			5	2	4	3			3	0	3	0

TABLE III.

No.	Opposites 1st.		Opposites 2nd.		Genus-Species.		Part-Whole.	
	R.	W.	R.	W.	R.	W.	R.	W.
1	6.5	.5	6.5	.5	F		9.0	1.0
2							F	
3	F		2.0	6.0	3.0	1.0	F	
4			F				F	
5							F	
6								
7								
8	2.0	1.0	8.0	0.0	6.5	3.5	8.0	2.0
9								
10	3.0	0.0	F		1.0	5.0	F	
11			F					
12								
13	5.0	1.0	6.0	0.0	F		F	
14	F		5.0	0.0	4.0	1.0	3.0	2.0
15			F					
16								



**MARKS GAINED BY DEFECTIVES**

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No.	Opposites 1st.		Opposites 2nd.		Genus-Species.		Part-Whole.	
	R.	W.	R.	W.	R.	W.	R.	W.
17	4.0	1.0	6.0	0.0	4.0	2.0	2.0	6.0
18			1.0	0.0				
19								
20	F		3.0	0.0	F		F	
21	F		F		F		F	
22								
23	11.5	.5	12.0	0.0	2.0	6.0	9.0	1.0
24	F		10.0	0.0	F		3.5	6.5
25			2.0	1.0				
26	2.0	0.0	3.0	0.0	F		1.0	2.0
27								
28			F					
29								
30								
31	F		6.0	0.0	6.0	1.0	4.0	0.0
32	2.5	1.5	5.0	0.0	0.0	3.0	2.0	2.0
33	2.0	0.0	3.0	0.0	F		3.0	1.0
34	6.0	1.0	7.0	1.0	F		3.0	6.0
35	10.0	0.0	12.0	1.0	10.0	0.0	6.0	0.0
36								
37								
38	F		5.0	1.0	F		F	
39	6.3	1.7	4.0	1.0	10.0	0.0	10.0	2.0
40								
41								
42	F		F		F		F	
43								
44	3.0	0.0	1.0	0.0	6.0	1.0	2.0	0.0
45	3.0	0.0	2.0	0.0			4.0	0.0
46	F		2.0	0.0	F		F	
47	2.0	0.0	2.0	0.0	4.0	2.0	F	
48	2.0	0.0	2.0	0.0	1.0	1.0	3.0	0.0
49	6.0	0.0	5.5	.5	4.0	2.0	4.0	1.0
50	F		F		F		F	
52	F		F		F		F	
53	3.0	0.0						
54	1.5	0.0	1.5	1.5	1.0	1.0	2.0	0.0
55	F		1.0	0.0	F		F	
56	F		F		F		F	
57	F		F		F		F	
58								
59	2.0	0.0	5.5	.5	6.0	0.0	5.0	0.0
60	3.0	1.0	2.0	2.0	3.0	2.0	F	
61	F		F		F		F	
62	9.0	4.0	5.5	1.5	1.0	0.0	9.5	.5
63	2.0	0.0	1.0	2.0	3.0	0.0	6.0	1.0
64	F		3.0	0.0	4.0	0.0	9.0	0.0
65	1.0	1.0	1.0	0.0	1.0	0.0	6.0	2.0
66	2.0	0.0	F		2.0	0.0	8.0	1.0
67	3.0	1.0	3.0	1.0	4.5	3.5	8.5	1.5

No.	Opposites 1st.		Opposites 2nd.		Genus-Species.		Part-Whole.	
	R.	W.	R.	W.	R.	W.	R.	W.
68	3.0	1.0	4.0	2.0	7.0	3.0	5.5	4.5
69	3.5	0.0	9.5	.5	9.0	1.0	9.5	.5
70	2.5	2.5	4.0	0.0	2.0	2.0	6.0	2.0
71	F		1.0	2.0	3.0	0.0	6.0	3.0
72	5.0	1.0	6.0	1.0	10.0	0.0	10.0	0.0
73	3.5	.5	3.0	0.0	4.5	.5	7.0	1.0
74	4.0	1.0	2.5	1.5	5.5	1.5		
75	1.0	0.0	3.0	0.0	4.5	.5		
76	F				F			
77	2.0	1.0	1.0	1.0	2.5	.5	1.0	0.0
78	5.5	1.5	7.0	1.0	8.5	1.5	9.5	.5
79	5.0	0.0	4.0	6.0	F		8.0	2.0
81	7.0	1.0	9.0	0.0	10.0	0.0	9.0	1.0
83	7.5	1.0	4.5	1.5	9.0	1.0	10.0	0.0
84	F		3.0	0.0	4.0	0.0	5.0	0.0
85	3.5	.5	3.5	.5	8.0	0.0		
86	2.0	0.0	3.0	1.0	2.0	2.0	5.0	4.0
87	3.0	0.0	4.5	.5	6.0	0.0	9.0	1.0
88	7.5	1.0	9.0	2.0	8.0	1.0	7.5	2.5
89	1.5	0.0	F		6.5	.5	6.0	4.0
90	2.0	.5	2.0	0.0	4.5	.5	5.0	1.0
91	2.5	.5	1.5	0.0	7.0	2.0	8.5	1.5
92	4.0	0.0	4.0	0.0	8.0	1.0	7.0	1.0
93	1.0	0.0	F		8.0	0.0	8.5	1.5
95	9.0	1.0			10.0	0.0		
96	1.5	.5			6.0	0.0		
97	4.0	0.0			8.5	1.5		
98	9.0	0.0	9.0	0.0	9.0	1.0	10.0	0.0
99								
100	F				F			
101	F		1.0	0.0	1.0	1.0	6.0	2.0
102								
103	1.5	1.0	2.0	0.0	5.0	2.0	8.5	1.5
104	1.0	0.0	F		5.0	0.0	3.0	2.0
105	1.5	0.0	F		6.5	.5	3.0	2.0
106								
107	6.0	5.0	7.5	3.5	9.5	.5	9.0	0.0
108	2.0		F		2.0	0.0	3.0	4.0
109	F				5.0	1.0		
110	1.0	1.0						
111	F				F			
112	.5	1.5	1.5	1.5	4.0	0.0	5.0	2.0
113	1.5	0.0	1.0	0.0	6.5	.5	6.0	1.0
114	F				8.0	2.0		
115	1.5	.5	1.0	2.0	3.0	3.0	5.0	2.0
116	3.0	.5	3.0	2.0	10.0	0.0	6.5	3.5
117								
118	6.0	1.5	7.0	2.0	10.0	0.0	9.0	1.0
119	F		F		F		4.0	0.0
120	1.5	0.0	1.0	0.0	5.0	1.0	6.5	1.5

No.	Opposites 1st.		Opposites 2nd.		Genus-Species,		Part-Whole.	
	R.	W.	R.	W.	R.	W.	R.	W.
121	F				2.0	0.0	3.0	4.0
122	F				F			
123								
124								
125	2.5	.5	4.0	2.0	4.0	0.0	6.5	3.5
126								
127	.5	.5	1.5	1.5	7.5	.5	9.0	0.0
128	F		2.0	3.0	9.0	1.0	8.0	2.0
129	2.5	.5	3.0	0.0	3.0	1.0	8.0	1.0
130	9.0	.5	15.0	0.0	10.0	0.0	10.0	0.0
131			F				9.0	0.0
132	2.5	2.5	2.0	5.0	F		4.0	6.0
133	F		F		2.0	0.0	4.0	3.0
134	2.0	0.0	F		1.0	0.0	5.0	2.0
135	9.0	.5	14.5	.5	9.0	1.0	9.5	.5
136	3.0	4.5	7.0	1.0	8.5	1.5	9.5	.5
137								
138	F				F			
<i>Moral Imbeciles</i>								
51	1.0	0.0	1.0	0.0	F		1.0	0.0
80	2.5	.5	6.5	2.5	5.0	1.0	8.0	2.0
82	9.0	1.0	6.5	.5	9.0	0.0	5.0	1.0
94	9.0	1.0					5.0	5.0

TABLE IV.

No.	Pulse.	Temperature.		Block Test.		1st.	Weight Test.		4th.
		1st.	2nd.	1st. sec.	2nd. sec.		2nd. shot.	3rd.	
1	108	98.6	99.0	25	23	+ 6	+ 2	+ 11	+ 12
2	102			30	23	F			F
3	112	97.2	97.8	57	33	- 4	+ 5	+ 5	+ 4
4	96	98.0	98.6	57	48	- 6	+ 1	+ 5	+ 5
5	120	96.4	98.2	47	40				
6	72	96.4		95	120	0	0	+ 15	+ 11
7	90	96.2		120	140	F			F
8	126	99.2	98.2	40	23	+ 3	+ 2	+ 2	+ 11
9	96	98.8	98.4	32	45	+ 5	+ 5	+ 1	- 4
10	96	98.2	98.8	40	28	+ 1	- 1	- 2	- 2
11	114	98.2	96.6	35	34	+ 9	+ 6	+ 7	+ 9
12	120			56	61	F			F
13	96	98.0	98.8	45	27	- 3	- 4	+ 8	+ 13
14	108	97.4	98.4	29	27	+ 13	+ 9	+ 11	+ 11
15	108	98.8	98.6	26	45	+ 11	+ 7	+ 3	+ 10
16	80	98.6	98.4	53	35	+ 2	+ 7	+ 6	+ 10
17	96	98.6	99.0	30	30	+ 12	+ 5	+ 2	+ 2
18	102	99.0	98.4	30	50	+ 16	+ 13	+ 8	+ 8
19	102	99.0		90	90	F			F
20	90	99.0	99.4	21	30	- 6	- 7	- 1	+ 1
21	96	97.2	98.0	54	40	+ 2	0	+ 9	+ 13
22	120			57	54	+ 12	+ 9	- 1	+ 1

No.	Pulse.	Temperature.		Block Test.		Weight Test.				
		1st.	2nd.	1st. sec.	2nd. sec.	1st.	2nd. shot.	3rd.	4th.	
23	108	96.6	97.2	47	27	+ 2	- 2	+ 10	+ 8	
24	96	98.0	99.0	30	28	+ 3	+ 8	+ 12	+ 5	
25	90	97.2	96.4	25	25	+ 14	+ 9	+ 7	+ 8	
26	120	98.6	98.4	18	20	0	- 7	+ 1	+ 1	
27	84	98.4		65	40	F			F	
28	90	99.0	99.2	47	30	0	+ 7	+ 6	+ 6	
29	96			47	25	+ 1	0	- 7	- 5	
30		100.0	99.8							
31	114	99.0	99.6	40		F			F	
32		98.4	98.6							
33	96	99.4	99.2	25	18	- 5	- 2	- 1	- 1	
34	108	98.4	99.0	80	32	+ 12	+ 8	+ 9	+ 7	
35	96	97.6	98.8	37	45	- 1	+ 6	+ 4	+ 4	
36	96	94.0		30	27	F			F	
37	108	98.4	100.4	27	25	+ 11	+ 9	+ 5	+ 2	
38	108	95.4	99.8	40	24	+ 1	- 4	+ 1	0	
39	120	99.2	99.6	35	32	+ 4	+ 4	+ 8	+ 6	
40	72	98.8		36	26	+ 4	- 1	+ 4	- 1	
41	96			28	20	+ 13	+ 6	+ 12	+ 12	
42	96	96.2	96.8	54	34	- 5	- 3	+ 4	+ 2	
43	90	98.2		133	82	- 6			F	
44	112			49	32	+ 3	- 4	+ 4	+ 8	
45	90	96.0	94.0	140	79	+ 8	+ 8	- 2	+ 7	
46	66	96.4	97.6	31	22	F			F	
47	84	97.8	99.2	41	21	+ 3	+ 9	- 4	+ 6	
49	96	98.0	97.2	25	22	- 2	- 2	+ 5	+ 5	
50	114			34	46	0	- 2	+ 21	+ 22	
53	90			43	33	+ 1	+ 3	0	+ 1	
54	84	96.4	96.4	26	26	+ 2	- 8	+ 3	+ 3	
55	84	98.2	98.6	37	25	+ 3	+ 3	- 1	+ 3	
56	72	98.6	98.8	63	66	- 14	- 12	+ 3	+ 3	
58	96			36	26	+ 7	+ 8	+ 13	+ 14	
59	72	97.2	97.4	57	29	- 1	+ 3	+ 2	+ 2	
60	78	94.2	95.0	83	88	+ 8	+ 6	+ 9	+ 9	
61	78	98.4	98.6	48	31	- 6	- 3	+ 5	- 2	
62	86	98.6	99.2	25	18	0	- 3	+ 4	+ 3	
63	90	98.8	98.4	32	31	+ 4	0	+ 3	+ 2	
64	98	98.0	98.2	41	27	0	0	+ 18	+ 5	
65	87	96.6	98.4	54	33	- 2	+ 3	+ 10	- 1	
66	98	98.0	99.0	42	36	+ 1	+ 8	- 5	- 1	
67	86	98.2	98.6	26	28	+ 6	+ 8	+ 14	+ 17	
68										
69	76	95.0	96.4	33	37	- 5	0	+ 8	+ 5	
70	69	99.4		53	33	+ 8	+ 5	+ 5	+ 4	
71	86	93.8*	98.2	35	19	+ 4	- 2	+ 11	+ 16	
72	56	98.4	98.6	47	28	- 1	- 3	+ 1	+ 5	
73	88	98.6	97.0	21	30	- 4	- 4	+ 8	+ 7	
74	89	99.2	98.6	21		+ 8	0	+ 2	+ 3	
75	66	96.4	98.2	22	15	- 3	+ 3	+ 1	+ 1	

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No.	Pulse.	Temperature.		Block Test.		Weight Test.			
		1st.	2nd.	1st. sec.	2nd. sec.	1st.	2nd. shot.	3rd.	4th.
76	80	98.8	98.6	42	26	+ 2	— 2	+ 8	+ 2
77	75	98.0	99.0	15	15	— 1	— 4	+ 17	0
78	65	96.2	99.0	35	33	+ 2	— 9	+ 9	+ 12
79	74	98.2	99.2	21	22	+ 12	0	— 2	0
81	98	99.2	98.8	17	15	+ 4	0	+ 6	+ 1
83	49	97.4	98.6	28	29	+ 4	— 1	+ 4	— 3
84	82	97.8	98.0	41	26	— 1	+ 1	+ 9	+ 11
85	89	98.2	99.2	45	52	+ 2	— 3	+ 2	— 1
86	82	98.8	98.0	23	19	+ 5	+ 3	+ 5	+ 7
87	91	95.0*	98.0	40	41	0	+ 9	— 3	— 1
88	89	98.8	99.2	20	17	+ 3	+ 10	+ 16	+ 6
89	98	97.6	98.0	40	29	+ 4	+ 5	+ 16	+ 3
90	87	99.2	98.4	33	40	+ 18	+ 16	+ 8	+ 13
91	95	99.4	98.6	25	19	+ 4	+ 4	— 1	0
92	85	98.8	98.4	19	25	+ 7	+ 3	+ 7	+ 5
93	96	97.2	98.4	35	31	+ 10	+ 3	+ 10	+ 6
123	73	96.4	98.0	46	28	+ 1	— 1	+ 12	+ 9
124	81	97.4	98.8	23	24	+ 8	+ 1	+ 9	+ 7
127	84	98.4	98.4	16	16	+ 3	+ 4	+ 15	+ 18
139	60			39	31	— 2	— 2	+ 14	— 1
140	90	96.2*		52	54	0	+ 7	+ 8	+ 3
142	90	99.4		80	68	F		F	
143	90	97.8		61	40	F		F	
144	96	98.2		55	30	+ 11	+ 11	— 5	— 2
145	72	99.4		45	26	— 5	— 2	+ 9	+ 9
146	90	97.6		55	25	+ 3	— 4	+ 3	+ 1
147	72	96.2		170	135	F		F	
148		97.4		170	97	— 4	— 7	+ 10	+ 5
149	102			32	32	+ 4	+ 5	0	0
150	102	99.4		60	40	— 3	— 11	+ 2	+ 8
151	66	98.0		120	85	+ 5	+ 4	+ 4	+ 2
152	90			135	170	F		F	
153	96			F	F	F		F	
154	102	NOTE. The cases				F		F	
155	114	marked * were				F		F	
156	84	mouth-breathers.				F		F	
157	96			36	32	+ 12	+ 4	— 2	— 2

## Moral Imbeciles

51	84	97.6	99.0	31	18	+ 12	+ 13	+ 8	+ 15
80	70	98.0	98.2	19	23	+ 6	+ 1	0	+ 1
82	64	98.6	98.6	30	19	— 4	— 3	+ 1	— 2
94	94	98.0	98.4	30	24	— 3	+ 1	+ 2	+ 3

TABLE V.

No.	Maze.				Opposite.		Noun.		Dictation.			
	Amt.	1st. Touches.	2nd. Amt.	Touches.	Individual R.	W.	Individual R.	W.	1st	2nd.	3rd.	4th.
1	24	47	21	37	12.0	0.0	9	1	8	12	9	14
2												
3	30	94	29	87	4.0	6.0	F		6	7	15	15
4	19	53	30	90			F					
5	20	51	24	66	F		F		4	3	4	8
6	4	14	F									
7	4	10	F									
8	16	24	14	13	5.0	1.0	6	0	8	10	6	14
9	20	26	30	55	F		8	0	9	11	4	14
10	30	62	30	58	F		7	2	3	4	2	1
11	30	45	30	66	2.0	2.0	6	0	4	11	6	10
12	30	119	21	82			2	1				
13	30	70	30	78	7.0	3.0	F		6	6	8	14
14	27	52	30	66	10.0	4.0	6	0	8	11	11	15
15	16	21	26	53	F		F		8	6	6	12
16	18	37	30	88	F		F		2	7	10	14
17	15	26	20	26	14.0	2.0	9	0	8	8	15	12
18	30	51	23	32	4.0	1.0	3	0	4	7	2	10
19	15	61										
20	30	95	30	110	6.5	2.5	F		4	7	2	7
21	13	40	17	65	3.5	4.5	10	3	7	11	6	16
22	22	75	25	89			4	4				
23	21	24	30	48	16.5	3.5	10	0	10	11	0	14
24	12	9	12	5	10.0	10.0	F		8	10	11	12
25	14	14	30	100	3.0	2.0	9	0	9	4	10	7
26	18	5	19	9	10.0	0.0	10	0	8	8	17	14
27	15	46										
28	16	43	20	56	F		5	2	4	3	8	7
29	14	48										
30	14	6	22	43	1.0	1.0	3	1	4	2	6	2
31	30	123	14	31	11.5	6.5	10	4	8	6	8	14
32	24	43	30	73	14.5	3.5	10	0	8	10	12	7
33	19	44	21	44	6.5	2.5	F		9	6	6	15
34	21	51	21	53	11.0	2.0	9	5	9	11	12	14
35	15	5	23	18	12.5	5.5	10	0	7	11	11	14
36	25	46										
37	22	44	30	76	14.5	3.5	9	0	8	10	8	14
38	30	98	21	45	9.5	2.5	F		10	12	11	8
39	30	59	30	48	13.5	5.5	9	0	7	7	10	14
40			27	96								
41												
42	21	66	30	123	11.0	1.0	5	1	7	5	6	14
43	9	32	9	40	F		F		F			
44	14	32	19	48	17.5	1.5	10	2	8	9	7	13
45	8	38	9	38	11.5	3.5	9	1	6	10	16	12
46	9	17	16	37	3.5	1.5	10	5	8	6	6	5

# MARKS GAINED BY DEFECTIVES

43

No.	Maze.				Opposite.		Noun.		Dictation.			
	1st. Amt.	Touces. 3	2nd. Amt.	Touces. 30	Individual. R.	W.	Individual. R.	W.	1st.	2nd.	3rd.	4th.
47	18				11.5	1.5	9	3	8	8	0	8
48												
49	15	13	10	3	12.5	7.5	9	0	8	12	12	12
50												
52							5	1				
53	14	18	14	22	15.5	3.5	8	0	8	7	12	9
54	20	18	30	33	12.0	1.0	9	0	5	6	13	13
55	12	26	17	44	12.0	1.0	3	3	6	7	10	8
56	5	8	7	4	3.0	1.0	4	0	10	6	5	11
57												
58	12	18	13	23	13.0	6.0	10	0	4	5	6	6
59	7	8	8	14	12.0	3.0	10	0	8	6	10	15
60	27	78	29	86	10.5	4.5	9	2	8	10	8	7
61	6	8	7	9	6.0	1.0	9	3	5	7	7	16
62	22	48	21	29	14.0	6.0	10	0	6	7	18	15
63	26	87	30	120	6.5	12.5	10	4	4	6	6	0
64	14	45	19	49	13.0	6.0	10	4	2	5	12	12
65	9	23	11	32	11.0	2.0			0	6	0	9
66	12	48	12	41	8.5	7.5	6	4	2	5	1	7
67	20	71	30	122	7.5	7.5	9	3	4	7	1	14
68					16.0	2.0	9	1	8	12	14	15
69	7	12	9	6	14.5	2.5	10	1	8	10	18	15
70	19	35	30	78	8.0	4.0	10	1	5	3	2	F
71	15	20	22	29	6.5	13.5	9	4	8	2	7	13
72	10	16	13	37	16.0	2.0	9	1	8	12	14	15
73	8	16	7	9	12.0	3.0	7	1	8	9	2	9
74	19	22	16	26	6.5	.5	10	1	8	9	7	14
75	20	36	14	7	15.0	5.0	10	0	9	7	0	15
76	11	30	13	28	16.0	3.0	5	2	5	9	3	16
77	30	103	30	86	4.0	5.0	F		2	7	0	2
78	14	17	21	27	14.5	5.5	6	0	8	11	14	16
79	30	111	30	93	F		10	1	3	8	7	13
81	21	12	28	25	16.5	3.5	10	1	8	12	9	14
83	14	17	16	15	17.0	0.0	10	0	7	10	16	15
84	21	56	23	57	9.0	2.0	8	1	6	6	0	11
85	14	25	22	68	12.5	1.5	11	4	7	3	3	18
86	22	40	28	43	5.0	.5	10	5	6	4	7	3
87	7	7	5	11	13.5	5.5	10	5	9	7	15	16
88	29	78	26	60	19.0	0.0	10	3	8	11	3	10
89	19	59	25	86	13.0	7.0	F		7	5	0	6
90	12	24	17	38	11.5	2.5	9	3	8	3	6	12
91	16	32	30	84	F		8	1	6	8	9	6
92	19	34	20	30	17.0	1.0	10	4	5	7	6	13
93	8	22	10	30	9.5	6.5	10	5	4	0	6	2
123	17	69	18	48	10.5	8.5	11	4	7	7	8	15

No.	Masc.				Opposite.		Noun.		Dictation.			
	Amt.	1st. Touches.	2nd. Amt.	Touches.	Individual. R.	Individual. W.	Individual. R.	Individual. W.	1st.	2nd.	3rd.	4th.
124	16	50	30	119	11.5	8.5	10	5	7	5	18	14
127	14	27	30	99	16.5	3.5	F					
142	14	58	19	87								
143	7	20	7	22								
144	11	13	11	9			2	1				
145	14	23	20	44			2	1				
146	8	20	7	14			F					
147	6	20	6	17								
148	4	13	7	19			10	2				
149					18.5	.5	7	1	8	11	16	15
150	8	25	13	50			F					
151	7	21	10	41								

*Moral Imbeciles*

51	9	12	14	25	11.5	6.5	10	2	6	5	6	6
80	22	26	18	5	14.0	2.0	9	4	4	6	8	14
82	17	17	25	29	17.0	3.0	F		6	9	0	16
94	19	23	9	3	12.0	2.0	10	5	8	10	2	11

§ 9. *Standard Marks Gained from Ordinary Children in the Tests*

WE have now a series of exact measurements of these defectives in a number of traits. Of course the very fact that in some of the mental tests the idiots showed some ability and in others failed utterly to sense the situation, is of itself interesting. However, the main value of such measurements will lie in a comparison of the standing of the idiots with that reached by children in general in the same tests. In order to make this comparison these measurements were obtained from ordinary individuals to the number of several hundred. The testing was not all done by myself. Professor Thorndike gave tests 1, 2, 3, 4 and 11; but as he gave them in practically the same way that I had given them to the defectives, the results are comparable. Tests 5, 6, 13 and 14 I gave to normal children myself. The standards for the physical measurements I obtained from other sources as shown later.

In finding the central tendency for ordinary children in these various measurements the median was used in each case. The medians, with their probable errors of distribution, were obtained from the actual records of the children for intervals a year apart and the differences divided proportionally between the intervening eleven months, so that a scale was formed for each measurement showing the ability of children of any month-age in terms of median and probable error. In measurements of height, weight, pulse, memory and efficiency of perception the records of the boys and the



girls had to be kept separate because of the differences due to sex. Separate standards were thus made in some cases for sex as well as for age. But in the remainder of the tests, the ability of the two sexes being approximately equal, the same standard was used.<sup>1</sup> In some of the measurements I could not obtain enough records from school children over thirteen to make the standards of median and probable error reliable. In those cases, as I had records from adults, I followed the general trend of the curve and filled in the standards for the ages fourteen, fifteen and sixteen. This is especially true of the intelligence tests.

The standards for the various measurements are given in Tables VI. to XXII. inclusive. Those in italics represent the standards for boys and those in Roman for girls. In most cases the medians are given for intervals of half a year; the others may be obtained by interpolation.

## STANDARDS

TABLE VI.—HEIGHT.

(In centimeters from the measurements of F. Boas.<sup>1</sup>)

Age.	Girls.		Boys.	
	Med.	P. E.	Med.	P. E.
7.5	116.1	3.4	<i>116.8</i>	<i>3.3</i>
8.0	118.9	3.6	<i>119.6</i>	<i>3.5</i>
8.5	121.4	3.7	<i>122.2</i>	<i>3.6</i>
9.0	123.8	3.7	<i>124.8</i>	<i>3.6</i>
9.5	126.3	3.8	<i>127.1</i>	<i>3.7</i>
10.0	128.9	4.4	<i>129.6</i>	<i>3.8</i>
10.5	131.5	4.9	<i>132.0</i>	<i>3.9</i>
11.0	134.2	4.4	<i>134.1</i>	<i>4.1</i>
11.5	136.9	4.0	<i>136.4</i>	<i>4.2</i>
12.0	139.8	4.3	<i>138.6</i>	<i>4.3</i>
12.5	142.8	4.5	<i>141.0</i>	<i>4.5</i>
13.0	146.0	4.8	<i>143.7</i>	<i>4.8</i>
13.5	148.9	5.0	<i>146.3</i>	<i>5.1</i>
14.0	151.3	4.7	<i>149.5</i>	<i>5.5</i>
14.5	153.6	4.4	<i>152.7</i>	<i>5.7</i>
15.0	155.1	4.1	<i>156.4</i>	<i>5.7</i>
15.5	156.6	4.0	<i>159.9</i>	<i>5.8</i>
16.0	157.4	3.9	<i>162.5</i>	<i>5.4</i>
16.5	158.1	3.8	<i>165.1</i>	<i>5.1</i>
17.0	158.6	3.8	<i>167.1</i>	<i>4.9</i>
17.5	159.1	3.8	<i>169.1</i>	<i>4.8</i>
18.0	159.2	3.8	<i>170.2</i>	<i>4.8</i>

<sup>1</sup> Report of U. S. Commissioner of Education for 1896-7, Vol. II., pp. 1541 ff.

TABLE VII.—WEIGHT.

(Girls in pounds from Bowditch.<sup>1</sup>  
Boys in kilograms from Boas.<sup>2</sup>)

Age.	Girls.		Boys.	
	Med.	P. E.	Med.	P. E.
8.0	49.5	3.5	<i>24.0</i>	<i>3.6</i>
8.5	52.0	3.5	<i>24.5</i>	<i>3.6</i>
9.0	55.0	3.5	<i>25.8</i>	<i>3.6</i>
9.5	59.2	3.5	<i>27.0</i>	<i>3.6</i>
10.0	62.0	3.5	<i>28.8</i>	<i>3.6</i>
10.5	65.3	3.6	<i>30.6</i>	<i>3.7</i>
11.0	66.5	3.5	<i>31.0</i>	<i>3.5</i>
11.5	68.8	3.2	<i>31.7</i>	<i>3.3</i>
12.0	73.3	3.3	<i>33.1</i>	<i>3.4</i>
12.5	78.3	3.5	<i>34.7</i>	<i>3.6</i>
13.0	83.0	4.2	<i>36.7</i>	<i>4.3</i>
13.5	88.7	4.8	<i>38.8</i>	<i>4.9</i>
14.0	93.6	5.0	<i>41.2</i>	<i>5.1</i>
14.5	98.4	5.2	<i>43.5</i>	<i>5.3</i>
15.0	102.4	5.0	<i>46.2</i>	<i>5.4</i>
15.5	106.1	4.8	<i>49.0</i>	<i>5.5</i>
16.0	109.0	5.1	<i>51.9</i>	<i>5.5</i>
16.5	112.0	5.4	<i>54.5</i>	<i>5.5</i>
17.0	114.2	5.6	<i>56.3</i>	<i>5.7</i>
17.5	115.5	5.8	<i>58.2</i>	<i>5.9</i>
18.0	115.4	5.8	<i>59.0</i>	<i>5.9</i>

<sup>1</sup> Measurements of Boston school children.

<sup>2</sup> Unpublished.

<sup>1</sup> *Educational Psychology*, E. L. Thorndike, page 117.

TABLE VIII.

WEIGHT TEST—100 GRAMS.  
(Median for 9 years obtained from  
36 cases, the medians for other  
years adapted from Gil-  
bert's tests.<sup>1</sup>)

Age.	Boys and Girls. Med.	P. E.
8.0	13.0	3.0
8.5	12.6	3.0
9.0	12.2	3.0
9.5	11.7	3.0
10.0	11.0	3.0
10.5	10.7	2.9
11.0	10.5	2.8
11.5	10.0	2.7
12.0	9.6	2.6
12.5	8.7	2.6
13.0	7.8	2.6
13.5	7.9	2.6
14.5	8.0	2.6
14.5	8.2	2.3
15.0	8.4	1.8
15.5	8.4	1.8
16.0	8.4	1.8
16.5	7.9	2.0
Adults	5.4	1.2

<sup>1</sup> *Yale Studies*, Vol. 1, pp. 80-87.

TABLE IX.—MAZE TEST.

(324 cases.)

	Boys and Girls. Amount.	Touches.
9 years.		
6-10		
11-14		4.0
15-18		18.0
19-22		20.0
10 and 11 years.		
6-10		1.0
11-14		6.0
15-18		13.5
19-22		25.0
12 and 13 years.		
6-10		1.0
11-14		3.5
15-18		10.0
19-22		13.0
14 and 15 years.		
6-10		.5
11-14		3.0
15-18		8.5
19-22		11.5
Adults.		
6-10		4.5
11-14		2.5
15-18		5.5
19-22		4.0
22-28		18.0

TABLE X.—PULSE.

(500 cases.)

	Age.	Med.	P. E.
Girls up to	15	95.5	8.6
	16	93.0	8.2
Adults		88.0	8.0
Boys up to	13	95.0	8.4
	14	88.6	6.2
	15	85.0	8.0
	16	84.6	6.2
Adults		90.0	10.0

TEMPERATURE.

(434 cases.)

	Age.	Med.	P. E.
Children up to	16	98.8	.8
Adults		98.6	1.0

TABLE XI.—A TEST.

(900 cases.)

	Girls.	Boys.
Age.	Med. P. E.	Med. P. E.
8.0	30.0 4.5	27.0 2.1
8.5	31.6 4.5	28.2 2.1
9.0	32.6 4.5	28.4 2.1
9.5	34.0 4.6	30.6 2.3
10.0	36.0 5.4	32.3 3.2
10.5	38.6 6.1	34.7 3.6
11.0	41.6 6.5	37.4 3.9
11.5	44.4 7.0	39.9 4.2
12.0	45.9 7.3	41.3 4.4
12.5	47.4 7.5	42.6 4.6
13.0	48.8 7.4	43.9 4.5
13.5	50.2 7.3	45.2 4.4
14.0	51.7 7.3	46.5 4.4
14.5	53.1 7.3	47.7 4.4
15.0	54.1 7.3	48.6 4.4
15.5	55.0 7.3	49.5 4.4
16.0	56.0 7.3	50.2 4.4
16.5	57.0 7.3	51.2 4.4

TABLE XII.—DICTATION 1.

(386 cases.)

Age.	Girls and Boys. Med.	P. E.
8.0	8.0	.9
8.5	8.3	.9
9.0	8.6	.9
9.5	8.7	.9
10.0	8.8	1.0
10.5	8.8	1.0
11.0	8.9	.8
11.5	8.9	.8
12.0	9.0	1.0
12.5	9.1	1.0
13.0	9.3	1.0
13.5	9.3	1.0
14.0	9.5	1.0
14.5	9.6	1.0
15.0	9.7	1.0
15.5	9.7	1.0
16.0	9.7	1.0
16.5	9.7	1.0
Adults	10.0	1.0

TABLE XIII.—DICTATION 2.

(386 cases.)

Age.	Girls and Boys. Med.	P. E.
8.0	10.2	1.1
8.5	10.3	1.1
9.0	10.6	.9
9.5	10.7	.9
10.0	10.8	.8
10.5	10.8	.8
11.0	10.8	.7
11.5	10.8	.7
12.0	10.8	.7
12.5	10.9	.7
13.0	11.0	.8
13.5	11.1	.9
14.0	11.3	1.0
14.5	11.4	1.0
15.0	11.5	1.0
15.5	11.5	1.0
16.0	11.5	1.0
16.5	11.5	1.0
Adults	12.0	1.0

TABLE XIV.—DICTATION 3.

(386 cases.)

Age.	Girls and Boys. Med.	P. E.
8.0	14.0	2.2
8.5	14.4	2.4
9.0	15.0	2.9
9.5	14.8	2.8
10.0	14.6	2.7
10.5	14.6	2.7
11.0	14.6	2.6
11.5	14.6	2.6
12.0	14.6	2.6
12.5	14.8	2.4
13.0	15.0	2.0
13.5	15.3	2.0
14.0	15.6	2.0
14.5	16.0	1.6
15.0	16.5	1.0
15.5	16.5	1.0
16.0	16.5	1.0
16.5	16.5	1.0
Adults	18.0	1.0

TABLE XV.—DICTATION 4.

(386 cases.)

Age.	Girls and Boys. Med.	P. E.
8.0	13.9	1.1
8.5	14.0	1.0
9.0	14.3	.8
9.5	14.3	.8
10.0	14.4	.7
10.5	14.4	.7
11.0	14.4	.7
11.5	14.4	.7
12.0	14.4	.7
12.5	14.6	.8
13.0	14.8	1.0
13.5	15.0	1.0
14.0	15.2	1.0
14.5	15.3	1.0
15.0	15.5	1.0
15.5	15.5	1.0
16.0	15.5	1.0
16.5	15.5	1.0
Adults	16.0	1.0

TABLE XVI.—DICTATION TOTAL.

(386 cases.)

Age.	Girls and Boys.		P. E.
	Med.		
8.0	11.5		1.3
8.5	11.8		1.3
9.0	12.1		1.3
9.5	12.1		1.3
10.0	12.1		1.3
10.5	12.1		1.3
11.0	12.1		1.2
11.5	12.1		1.2
12.0	12.1		1.2
12.5	12.3		1.2
13.0	12.5		1.2
13.5	12.7		1.2
14.0	13.0		1.2
14.5	13.2		1.1
15.0	13.5		1.0
15.5	13.5		1.0
16.0	13.5		1.0
16.5	13.5		1.0
Adults	14.0		1.0

TABLE XVII.

MEMORY OF RELATED WORDS.

(288 cases.)

Age.	Girls.		P. E.	Boys.	
	Med.			Med.	P. E.
8.0	13.0	1.6		13.0	1.9
8.5	13.4	1.6		13.4	1.9
9.0	14.0	1.7		14.0	2.0
9.5	14.6	1.8		14.4	1.9
10.0	15.3	1.9		15.0	1.7
10.5	15.9	1.8		15.0	1.7
11.0	16.5	1.7		15.0	1.7
11.5	16.3	1.7		15.7	1.7
12.0	16.0	1.6		16.4	1.8
12.5	16.4	1.6		16.4	1.8
13.0	17.0	1.5		16.5	1.8
13.5	17.2	1.5		16.7	1.6
14.0	17.5	1.5		16.9	1.3
14.5	17.5	1.5		16.9	1.3
15.0	17.5	1.5		16.9	1.3
15.5	17.6	1.5		16.9	1.3
16.0	17.8	1.5		17.0	1.3
16.5	17.8	1.5		17.0	1.3
Adults	17.0	1.9		16.5	1.5

TABLE XVIII.

MEMORY OF UNRELATED WORDS.

(270 cases.)

Age.	Girls.		P. E.	Boys.	
	Med.			Med.	P. E.
8.0	11.5	1.3		11.1	1.6
8.5	11.9	1.3		11.6	1.4
9.0	12.4	1.4		12.2	1.7
9.5	13.3	1.4		12.2	1.7
10.0	14.4	1.4		12.2	1.7
10.5	14.4	1.4		12.3	1.7
11.0	14.3	1.4		12.5	1.8
11.5	14.2	1.4		12.6	1.8
12.0	14.0	1.5		12.8	1.8
12.5	13.8	1.5		13.1	1.9
13.0	13.5	1.5		13.5	2.1
13.5	13.7	1.5		13.6	2.1
14.0	14.0	1.5		13.7	2.2
14.5	14.0	1.5		13.7	2.2
15.0	14.0	1.5		13.7	2.2
15.5	14.3	1.5		13.8	2.2
16.0	14.5	1.5		14.0	2.2
16.5	14.5	1.5		14.0	2.2
Adults	13.0	1.4		12.8	1.2

TABLE XIX.

PART-WHOLE TEST.

(504 cases.)

Age.	Girls and Boys.	
	Med.	P. E.
8.0	6.5	2.3
8.5	7.1	1.8
9.0	7.8	1.3
9.5	7.8	1.6
10.0	7.8	1.9
10.5	8.2	1.5
11.0	8.7	1.1
11.5	8.7	1.1
12.0	8.7	1.2
12.5	8.8	.9
13.0	9.0	.7
13.5	9.0	.7
14.0	9.0	.7
14.5	9.0	.7
15.0	9.0	.7
15.5	9.0	.7
16.0	9.0	.7
16.5	9.0	.7
Adults	10.0	.5

TABLE XX.

## GENUS-SPECIES TEST.

(511 cases.)

Age.	Girls and Boys.		P. E.
	Med.		
8.0	5.0		2.0
8.5	5.0		2.3
9.0	5.0		2.7
9.5	6.0		2.8
10.0	7.0		2.9
10.5	8.1		2.5
11.0	9.2		1.9
11.5	9.2		1.3
12.0	9.2		.7
12.5	9.2		.6
13.0	9.3		.4
13.5	9.3		.4
14.0	9.3		.5
14.5	9.4		.5
15.0	9.5		.5
15.5	9.5		.5
16.0	9.5		.5
16.5	9.5		.5
Adults	10.0		.0

TABLE XXI.

## OPPOSITES TEST 1.

(605 cases.)

Age.	Girls and Boys.		P. E.
	Med.		
8.0	7.4		2.0
8.5	8.2		2.0
9.0	9.0		2.0
9.5	9.4		2.4
10.0	9.9		3.0
10.5	11.1		3.0
11.0	12.5		3.0
11.5	12.8		3.0
12.0	13.5		2.6
12.5	13.7		2.6
13.0	14.0		2.5
13.5	14.2		2.4
14.0	14.5		2.3
14.5	14.7		2.3
15.0	15.0		2.3
15.5	15.2		2.3
16.0	15.5		2.3
16.5	15.5		2.3
Adults	20.0		1.0

TABLE XXII.

## OPPOSITES TEST 2.

(608 cases.)

Age.	Girls and Boys.		P. E.
	Med.		
8.0	8.7		1.4
8.5	9.1		1.5
9.0	9.5		1.7
9.5	10.5		1.9
10.0	11.5		2.2
10.5	12.3		2.5
11.0	13.1		2.9
11.5	13.8		3.2
12.0	14.7		3.6
12.5	15.4		3.0
13.0	16.4		2.4
13.5	17.0		2.2
14.0	17.8		2.0
14.5	18.1		2.0
15.0	18.5		2.0
15.5	18.7		2.0
16.0	19.0		2.0
16.5	19.0		2.0
Adults	20.0		1.0

TABLE XXIII.

## a-t TEST.

(900 cases.)

Age.	Girls.		Boys.	
	Med.	P. E.	Med.	P. E.
8.0	11.8	1.8	10.0	1.6
8.5	12.0	1.8	11.0	1.6
9.0	12.3	1.9	11.3	1.7
9.5	12.5	2.0	11.5	1.8
10.0	12.8	2.2	11.8	2.0
10.5	13.2	2.4	12.1	2.2
11.0	13.9	2.5	12.7	2.3
11.5	14.5	2.7	13.3	2.4
12.0	14.9	2.9	13.7	2.5
12.5	15.4	3.0	14.1	2.7
13.0	16.1	3.0	14.8	2.7
13.5	17.1	3.0	15.7	2.7
14.0	17.9	3.0	16.4	2.7
14.5	18.5	3.0	17.0	2.7
15.0	18.7	3.0	17.2	2.7
15.5	19.0	3.0	17.4	2.7
16.0	19.3	3.0	17.7	2.7
16.5	19.5	3.0	18.0	2.7

§ 10. *Method of Comparing Defective Children with Ordinary Children*

WE now have two series of grades in the same measurements, one set from mentally defective children and the other from ordinary school children. The usual method of comparing such results is to compare the records of one set of individuals with the central tendency of those of the others of the same age and sex. But in this case there were not enough defectives of any age to make the results gained from such treatment of any value, consequently a different method had to be adopted. The method used in dealing with the majority of the measurements was one which enabled me to compare the records of all of the defectives with those of all the ordinary children without restriction as to age or sex. Another very decided advantage is the fact that the units of grading are identical throughout all the measurements, as will be evident from the following description.

The difference between the record of each defective in any test and the median for an ordinary child of the same age and sex was found. This difference was then transmuted into positive or negative multiples of the probable error as the case required. For instance, referring to Table III., No. 23, whose age is 12 years 7 months, has a mark of 12 in the second opposite test. Table XXII. gives the median for that test at that age to be  $15.4 +$  (the actual figures by interpolation being 15.6); the difference therefore is  $-3.6$ . The probable error in the standard for that age is  $< 3.0$  (2.9), then  $-3.6$  is  $-1.249$  times the probable error. Hence individual 23 is 1.25 times the probable error below the grade reached by 50 per cent. of ordinary children of the same age and sex in this test. By thus transmuting the difference between the grading received by defectives and ordinary children respectively in every test into multiples of the probable error of the appropriate age and sex I can compare the records of the 150 defectives tested with the 500 or 600 ordinary children, just as if I had 150 idiots and 600 school children all of the same age and sex. Not only by this method can I consider all my cases together, but each test is, so far as is possible, comparable with every other, irrespective of whether the trait examined is physical or mental. This, so far as I know, has not yet been done. For instance, a mark of 0 in height,  $-2.5$  in a memory test,  $-4$  in the part-whole test and  $+1.19$  in the measure of perception, means that the individual was just at the median of children in general as to height; nearly twice as far below the median in the test of intelligence as in the memory test; while in the test of perception

he was above the central tendency for normals. This method, then, provides a measure by which we can tell not only how far the idiots are below school children in the various traits tested, but how much farther below they are in one mental trait than in another and whether they are equally deficient in physical and mental traits.

As a final mark, then, each child has a grade, in terms of the probable error above or below the median for normal children, showing the extent of his ability in each measurement. These figures are given in Tables XXVIII. to XXXII. inclusive. In Table XXVIII. the record for No. 33 reads: age, 8 years, 2 months; height, 1.30 P. E. above that of children of that age in general; weight, .15 P. E. below normal; ability in the A test, 2.31 P. E. above that of ordinary children; ability in the a-t test, 3.42 P. E. below normal.

In tests 5, 11 and 12 the results do not appear in this form, and consequently they must be considered separately. The reason for this difference in treatment is different in each case. In test 5 the median for the ordinary child of eight years old was 10 or perfect, in which case there was no opportunity of showing improvement due to increase in age, and therefore the results gained by the use of the method mentioned above would not mean the same in this test as in the others, for the ability of children over eight should presumably be represented by a higher mark than 10. In this test, therefore, I simply computed the percentage of defectives for each age that fell below 10, or the perfect mark, and then did the same for school children in general. The result records the percentage of defectives that fall below a certain grade and the percentage of ordinary children of the same age that fall below that grade in the same test. Table XXIV. states the results of the class tests, and Table XXV. the results of the same test repeated with single individuals, the same standard being used for comparison in each case.

TABLE XXIV.

Per Cent. of Defectives Below Grade of 10.			Per Cent. of Ordinary Children Below Grade of 10.
8 years old	88%	(9 cases)	33.3%
9 " "	100	(4 cases)	30
10 " "	75	(4 cases)	21
11 " "	66.6	(6 cases)	14
12 " "	67	(19 cases)	14
13 " "	100	(16 cases)	10
14 " "	80	(10 cases)	1
15 " "	70	(10 cases)	
Adults	66.6	(36 cases)	

TABLE XXV.

Per Cent. of Defectives Below Grade of 10.		
8 years old	81%	(11 cases)
9 " "	100	(8 cases)
10 " "	50	(6 cases)
11 " "	70	(10 cases)
12 " "	60	(15 cases)
13 " "	60	(10 cases)
14 " "	42	(7 cases)
15 " "	66	(6 cases)
Adults	70	(20 cases)

This particular measurement is one of actual knowledge, for most children of eight have had training in picking out 'names of things' and in 'naming objects,' and of course children of nine and ten have begun the study of grammar, so that their training has been very much more definite in this line than that of the idiots. We therefore should expect to find idiots below normal children in this measurement simply from the fact of the dissimilarity of training. In fact it should surprise us that the majority do as well as they do and that some of the 'idiots' reach the same grade as the ordinary child.

As test 11 was designed to test chiefly motor control, the number of touches made in doing any number of units is the important factor. The comparisons are in terms of the percentage of defectives making more touches in covering a certain number of units of amount than the median number made by ordinary children of the same age in covering the same amount. The medians used for this comparison are given in Table IX. As may be seen from the standard, those children who finished before time were not taken into account, for we do not know their maximum ability. The results are given in Table XXVI., the same standard being used in the two trials.

TABLE XXVI.

## RESULTS OF THE MAZE TEST.

1st Trial.			2nd Trial.		
Per Cent. of Defectives Falling Below the Median for Ordinary Children.			Per Cent. of Defectives Falling Below the Median for Ordinary Children.		
9 years	100%	(5 cases)	100%	(3 cases)	
10 and 11 years	90	(11 cases)	87	(8 cases)	
12 and 13 years	81	(24 cases)	100	(17 cases)	
14 and 15 years	100	(11 cases)	88	(9 cases)	
Adults	100	(12 cases)	100	(12 cases)	

These results seem to confirm Johnson's statement that the feeble-minded are 'slightly inferior' to ordinary children in their motor control. One might feel that the figures show more than a slight



inferiority; however, we must bear in mind that two factors actually enter into the result, amount and errors, and that combination always complicates matters. The idiots did more on the average than the ordinary child and it may be that had children in general done as much, that is, had there been as many school children taking as high a rate of speed as that adopted by the defectives, the difference in control might not have been so marked.

Of course this lack of muscular control on the part of the defectives is partly accounted for by the diseased condition of some of them. Some were paralytic and had not full control of their hands, and others had very poor eyesight and so were hampered in their performance of the test in a way that ordinary children were not. However, the conclusion seems to stand that the idiots have less muscular control than other children of the same age. Just how much can not be stated with the exactitude possible in the tests where complete standards were at hand.

In the block test (number 12) I have records of nine-year-old children and adults only and so could not follow my usual method. Consequently I have compared the records of the idiots of various ages with the median for nine-year-olds, and stated my results in terms of the percentage of idiots who fall below the standard reached by 50 per cent. of ordinary nine-year-olds. The median time for the school children in the first trial with this test was 30 seconds; in the second trial it was 24 seconds. The results are given in Table XXVII.

TABLE XXVII.

	BLOCK TEST.			
	1st Trial.		2nd Trial.	
8 years	70%	(10 cases)	87%	(8 cases)
9 "	100	(11 cases)	90	(11 cases)
10 "	50	(6 cases)	66.6	(6 cases)
11 "	66.6	(9 cases)	87	(8 cases)
12 "	60	(23 cases)	73	(23 cases)
13 "	72	(11 cases)	45	(11 cases)
14 "	71	(7 cases)	87	(7 cases)
15 "	80	(5 cases)	80	(5 cases)
16 "	83	(6 cases)	100	(5 cases)
Adults	76	(13 cases)	78	(13 cases)
All ages	70		78	

These figures show that in the ability or rather in the combination of abilities measured by this test the majority of the idiots are much worse than ordinary children. In only two instances do the defectives of any age equal or exceed the median for nine-year-olds—the ten-year-old defectives 50 per cent. below, and those thirteen

years old, 45 per cent. below. This test seems to me to measure to a certain extent the ability of dealing quickly and well with a new situation—to measure, in a way at least, common sense. Some of the feeble-minded showed a lack of ability in dealing with the situation to an extent that was not even approached by the school children. Some of them picked up one block after another and tried it in the same hole, often picking up the same block time after time; others would hold on to one block and screw and push and try their best to force it into the hole. Three of them failed utterly in putting the blocks into their proper places. And yet this lack of ability was not true of all—in several instances the defectives excelled the ordinary children in both time and common sense.

It may be that the case against the idiots is not so bad as it seems to be, for it is probable that the amount of improvement between the first and second trials is greater in their case than with children at large. As yet no definite statement can be made, as the comparative amount of improvement has not been worked out.

§ 11. *Tables Showing the Results of the Comparison of Defective Children with Ordinary Children*

TABLE XXVIII.

No.	Age. yr. m.	Ht.	Wt.	A. 1st.	a-t. 1st.
1	12 2	+ 2.11	+ 1.14	— 2.11	— 1.79
2	10 1	— 5.40	+ 2.12	— 4.82	— 4.95
3	9 4	— 3.86	— 1.01	— 2.09	+ 2.32
4	8 5	— 2.70	— 1.43		
5	9 11	— 2.33	— 4.61		
6	12 11	— 3.63	— 5.65		
7	14 5	— 2.34	— 4.04		
8	9 5	— 1.26	— 1.69	— 4.60	— 2.75
9	9 5	— 1.00	+ 1.52		
10	12 5	+ 2.61	+ 1.24	— 2.16	— 1.10
11	8 5	+ .22	+ 2.15	— 1.64	— 1.67
12	11 8	— 3.61	— 6.88	F	F
13	8 11	+ .97	+ .89	— .76	— 1.21
14	8 2	+ .05	+ .66	— 2.58	— 1.11
15	10 3	+ 2.63	+ 7.07	— 1.26	— 2.47
16	9 10	— 2.62	— 2.32		
17	8 5	— .50	— .12	— 1.64	— 1.11
18	12 10	+ .24	+ 2.52	— .17	— 1.96
19	9 6	+ .71	+ 2.43		
20	13 1	— 1.27	+ 2.71	— 1.90	F
21	11 10	+ .76	+ .67	— 3.67	— 2.39
22	7 11	— 1.22	— .38		
23	12 7	— .72	— 2.12	— .61	+ 1.13
24	12 6	— .40	— 3.26	— 1.39	— 2.46

No.	Age. yr. m.	Ht.	Wt.	A. 1st.	a-t. 1st.
25	11 4	+ .25	+ 1.25	- 1.68	- 1.65
26	10 0	- 1.11	- 1.43	+ .25	- .36
27	11 7	- .59	- 1.13		
28	9 0	- .76	- .72	- 2.58	- 1.74
29	12 0	- .65	- .11	- 4.92	- 4.97
30	11 2			- .83	- 5.24
31	8 9	- .65	- 2.72	- .89	- 1.22
32	8 10			- 1.31	+ 2.89
33	8 2	+ 1.30	- .15	+ 2.31	- 3.42
34	12 1	- 2.40	- 3.59	- 2.32	- .69
35	12 8	+ 1.37	+ 5.49	+ .15	+ 1.76
36	12 5	- 2.96	- 5.51	F	
37	11 2	- 2.35	- 2.95		
38	13 0	0.00	+ 1.61	- .38	+ .63
39	10 10	+ 1.89	- 4.38	- 1.03	- 1.44
40	8 7	- 1.49	- .29	- 4.62	F
41	12 0	+ .42	- .16	- 2.18	- 4.61
42	11 0	+ .93	- .15	- 1.39	- 2.48
43	20 ?				
44	14 0	- 2.64	+ 2.09	- .23	- 5.63
45	22 0				
46	11 0	- 4.64	- 2.98	F	F
47	13 0	+ .31	+ .26	- .87	- 1.78
48	15 0			- 4.01	F
49	17 ?	- .63	+ .43		
50	22 2	+ .24			
52	21 4			F	F
53	20 0				
54	14 0	- .11	- 2.30	+ 6.48	- .89
55	10 2	+ .37	- .09	- 4.78	- 3.40
56	13 0	+ 3.30	+ 2.43	- 4.42	F
57	14 0				
58	19 ?				F
59	16 0	- 3.30	- .95		F
60	29 0				
61	16 0	- .85		- 2.23	F
62	18 1	+ .17	+ 2.12		
63	13 4	- .18	+ .38	- 5.07	F
64	12 11	- 1.89	- .05	- 4.26	F
65	12 9	+ .51	+ 1.48	- 4.35	F
66	14 4	- 2.41	- 2.45	- 6.89	- 4.75
67	12 1	+ 2.46	+ 1.57	- 5.89	F
68	16 3	+ .06	- 2.40	- 4.05	- 5.10
69	14 0	+ 2.32	+ 5.38	- 5.17	- 4.96
70	15 1	- .37	- 1.76		
71	13 11	+ 1.01	+ 1.27	+ 1.21	F
72	15 2	+ 1.74	+ 1.01	+ 4.98	F
73	14 3	+ 2.04	+ .54	- 7.54	- 4.94
74	11 11	+ 3.42	+ 2.42	+ 2.12	F
75	14 3	- 1.33	- .80	+ .66	F

No.	Age. yr. m.	Ht.	Wt.	A. 1st.	a-t. 1st.
76	13 9	+1.74	+1.20	-6.11	-5.26
77	17 7	-4.76	-.88		
78	17 1	-.98	-.58		
79	15 2	+.35	+.63	-1.89	-4.75
81	12 4	+1.24	+.16	-.12	+1.93
83	16 1	+.32	+4.61	-1.68	-.76
84	16 2	-1.72	-.60	-5.32	F
85	13 11	-5.31	-3.25	-4.16	F
86	13 2	+.03	+.03	-2.54	+ .67
87	14 0	+2.44	+.92	+5.12	F
88	13 9	-1.76	-3.34	-3.11	-4.50
89	13 10	+.21	-1.61	-4.42	-3.26
90	15 1	+1.14	+5.58	-2.92	-3.26
91	12 5	-.28	-.18	-2.09	F
92	12 4	+.02	-.47	+ .01	F
93	16 1	+.82	-1.38	-2.64	-5.76
95	19 11				
96	16 7	-.24	-.80	-3.73	-6.49
97	17 6	-2.84	-.83		
98	17 1				
99	8 6	-1.46	-1.55		
100	12 9	-3.57	-.98	-2.49	-4.63
101	13 9	+1.50	+.52	-4.51	F
102	13 0	-.96	-2.81	-4.71	
103	20 0				
104	16 7	-1.08	+.99	-4.53	F
105	20 1				
106	13 11	-3.92	-4.16		
107	19 6				
108	12 7	+.38	+1.58	-1.14	F
109	12 0	+.33	+2.06	-5.53	-2.68
110	13 5	-2.19	-.84	-4.78	+2.41
111	15 9	-3.47	-5.62	-5.18	-4.56
112	13 3	+1.82	+1.45	-4.94	-4.56
113	8 3	+6.22	+18.11	-3.09	F
114	8 0	+3.81	+2.78		
115	13 7	-6.96	-2.73	-6.09	F
116	19 1				
117	8 3	-1.79	-2.75	-3.32	
118	17 4	-1.61	-3.97		
119	12 0	+2.11	+3.26	-7.81	-5.08
120	16 6	-4.11	-5.79	-4.01	-2.83
121	15 3	+.74	+.82	-9.57	F
122	17 3	+.41	-1.29		
123	12 7				
124	12 5	+3.14	+1.71		
125	18 7	-2.69	-5.32		
126	6 0				
127	12 11	+2.52	+6.95	+1.29	-2.36
128	16 9	+.57	+.06	-4.05	F

No.	Age. yr. m.	Ht.	Wt.	A. 1st.	a-t. 1st.
129	16 8	+ 1.64	+ .39	- 5.28	- 5.50
130	19 1				
131	15 2				
132	19 10				
133	12 1	- 1.41	- .85		
134	14 5	- 1.68	- .93	- 6.96	F
135	15 6	- 1.39	- 1.39	- 2.62	+ 1.71
136	17 4	+ .74	- 1.13		
137	18 4	- 3.51	- 1.78		
138	8 0	+ 3.81	+ 2.80		
139	16 0	- 1.69	+ .33		
140	12 0	+ 1.65	+ 2.98		
141	9 7	- 2.81	- .48		
142	8 0	- 1.05	- .15		
143	15 0	- .74	- .95	- 6.73	- 5.99
144	9 0		+ 1.80	- 6.38	- 5.41
145	9 0		+ 3.28	- 1.14	- 5.41
146	11 0		+ .90	- 6.26	F
147	16 0	0.00	- .75		
148	20 0				
149	18 0	- 3.30	- 2.47		
150	12 0	- 2.12	- 2.06	- 2.80	F
151	12 0	+ 2.00	+ .59		
152	9 7	+ .53	- .23		
153	9 0	- 1.41	- .29		
154	12 0	+ .21	- 4.94		
155	8 0	- .30	- 1.58		
156	8 0	- 2.43	- 4.15		
157	10 0	+ .77	+ .15		

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51	10 0	+ .50	+ .48	+ 14.28	- 5.40
80	15 1	+ .05	- .97	+ 3.48	+ 2.15
82	11 9	+ .93	- .24	- .84	F
94	10 0	+ 3.01	+ .92		

TABLE XXIX.

No.	Dictation. 1st.	Dictation. 2nd.	Dictation. 3rd.	Dictation. 4th.	Dictation. Total.
1	- 1.00	+ 1.71	- 1.39	- .57	- 1.17
2					
3	- 2.88	- 4.00	+ .04	+ .87	- 1.62
4					
5	- 5.22	- 8.55	- 3.83	- 7.87	- 5.71
6					
7					
8	- .77	- .64	- 3.08	- .37	- 2.00
9	+ .33	+ .44	- 3.76	- .37	- 2.00
10	- 6.00	- 9.71	- 4.85	- 19.57	- 8.00

No.	Dictation. 1st.	Dictation. 2nd.	Dictation. 3rd.	Dictation. 4th.	Dictation. Total.
11	— 4.66	+ .63	— 3.47	— 4.00	— 3.08
12					
13	— 2.76	— 4.09	— 2.47	— .22	— 2.71
14	— .01	+ .72	— 1.41	+ 1.00	— .31
15	— .80	— 6.00	— 3.21	— 3.42	— 3.16
16	— 7.44	— 4.11	— 1.63	— .37	— 3.00
17	— .02	— 2.09	+ .32	— 2.00	— .77
18					
19					
20					
21	— 2.37	+ .28	— 3.31	+ 2.28	— 1.75
22					
23					
24					
25	+ .12	— 9.71	— 1.77	— 10.57	— 5.08
26	— .80	— 3.50	+ .91	— .57	— .31
27					
28	— 5.11	— 8.44	— 2.42	— 9.12	— 5.08
29					
30	— 5.00	— 12.57	— 3.31	— 17.71	— 9.00
31	— .33	— 4.40	— 2.58	— .22	— 2.24
32	— .55	— .50	— 1.04	— 8.00	— 2.16
33	+ 1.00	— 3.81	— 3.69	+ 1.00	— 2.00
34	0.00	+ .28	— 1.00	— .57	— .32
35					
36					
37	— 1.12	— 1.14	— 3.31	— .57	— .50
38					
39	— 2.00	— 4.25			— 2.00
40					
41					
42	— 2.37	— 4.72	— 3.65	— .57	— 3.42
43	F				
44	— 1.50	— 2.30	— 4.30	— 2.20	— 3.50
45	— 4.00	— 2.00	— 2.00	— 4.00	— 3.00
46	— 1.12	— 6.85	— 3.31	— 13.28	— 5.00
47	— 1.30	— 3.86	— 7.50	— 6.80	— 5.41
48					
49	— 2.00	0.00	— 6.00	— 4.00	— 3.00
50					
52					
53	— 2.00	— 5.00	— 6.00	— 5.00	— 5.00
54	— 4.50	— 5.30	— 1.30	— 2.20	— 3.33
55	— 2.80	— 4.75	— 1.71	— 9.14	— 3.39
56	+ .70	— 6.37	— 5.00	— 3.80	— 3.75
57					
58	— 6.00	— 7.00	— 12.00	— 10.00	— 8.80
59	— 2.00	— 6.00	— 8.00	— 1.00	— 4.30
60	— 2.00	— 2.00	— 10.00	— 9.00	— 5.80
61	— 5.00	— 5.00	— 11.00	0.00	— 5.30

No.	Dictation. 1st.	Dictation. 2nd.	Dictation. 3rd.	Dictation. 4th.	Dictation. Total.
62	— 4.00	— 5.00	0.00	— 1.00	— 2.50
63	— 5.30	— 5.00	— 4.50	— 14.80	— 7.12
64	— 7.20	— 7.62	— 1.45	— 2.66	— 4.50
65	— 9.10	— 7.00	— 6.44	— 7.00	— 7.75
66	— 7.50	— 6.30	— 14.80	— 8.20	— 7.75
67	— 5.00	— 5.42	— 5.24	— .57	— 4.66
68	— 2.00	0.00	— 4.00	— 1.00	— 1.80
69	— 1.50	— 1.30	+ 5.14	+ .30	— .08
70	— 4.70	— 8.50	— 14.50	— 15.50	— 11.00
71	— 1.30	— 9.10	— 4.25	— 2.10	— 4.92
72	— 1.70	+ .50	— 2.50	— .50	— 1.35
73	— 1.50	— 2.30	— 13.20	— 6.20	— 5.00
74	— .12	— 2.57	— 2.95	+ .57	— 2.16
75	— .50	— 4.30	— 15.70	— .20	
76	— 4.30	— 2.62	— 6.20	+ 1.00	— .20
77	— 5.00	— 3.00	— 15.00	0.00	— 5.80
78	— 2.00	— 1.00	— 4.00	0.00	— 1.80
79	— 6.70	— 3.50	— 9.50	— 2.50	— 6.50
81	— 1.10	+ 1.57	— 2.30	— .57	— 1.25
83	— 3.00	— 2.00	— 2.00	— 1.00	— 2.00
84	— 4.00	— 6.00	— 19.00	— 5.00	— 8.30
85	— 2.30	— 9.00	— 6.25	+ 3.80	— 4.33
86	— 3.30	— 3.87	— 4.00	— 11.80	— 6.25
87	0.00	— 4.30	— .30	+ .80	— 1.08
88	— 1.30	0.00	— 6.20	— 5.00	— 4.00
89	— 2.30	— 6.00	— 7.75	— 9.00	— 7.00
90	— 1.70	— 8.50	— 10.50	— 3.50	— 7.30
91	— 3.10	— 4.12	— 2.38	— 10.62	— 4.33
92	— 4.10	— 5.57	— 3.48	— 1.87	— 4.08
93	— 6.00	— 12.00	— 12.00	— 14.00	— 11.00

*Moral Imbeciles.*

51	— 2.20	— 9.25	— 3.19	— 12.00	— 4.94
80	— 5.70	— 5.50	— 8.50	— 1.50	— 5.50
82	— 3.62	— .28	— 5.62	+ 2.28	— 3.66
94	+ .80	— 1.00	— 4.66	— 4.85	— 3.38

TABLE XXX.

No.	Part-Whole.	Genus-Species.	Opposite. 1st.	Opposite. 2nd.	Memory (unrel.).	Memory (rel.).
1	+ .28	F	— 2.69	— 2.47	— 4.01	— 1.34
2				— 4.81		
3	F	— .75	F	— 4.44	— 6.37	— 4.21
4				F		
5						
6						
7						
8	F	F	— 3.04	— 4.05	— 2.93	— 1.51
9					— 1.51	

No.	Part-Whole.	Genus-Species.	Opposite. 1st.	Opposite. 2nd.	Memory (unrel.).	Memory (rel.).
10	F	— 8.85	— 4.42	F	— 6.54	— 3.87
11			— 3.00	F		
12						
13	F	F	— 1.45	— 2.12	— 1.65	— .22
14	— 1.69	— .48	F	— 2.71	+ .85	+ .34
15			F	F		
16						
17	— 2.64	— .46	— 2.00	— 2.00	— .71	+ .85
18			— 4.07	— 4.18		
19						
20	F	F	F	— 5.64	— 3.01	
21	F	F	F	F	— 3.65	— 2.74
22						
23	+ .22	— 14.40	— .84	— 1.25	— .47	— .47
24	— 5.80	F	F	— 1.80	— 2.54	— 2.54
25			— 3.60	— 3.74		
26	+ 3.58	F	— 2.63	— 3.68	— 5.29	— 5.29
27						
28			F	F		
29						
30			F			
31	— 2.13	+ .41	F	— 2.06	— 2.29	— .86
32	— 3.67	F	— 2.65	— 2.68	— .93	— .93
33	— 1.71	F	— 2.80	— 4.14	— 3.29	— 3.54
34	— 4.75	F	— 2.88	— 2.23	— 2.00	— 3.34
35	— 3.22	+ 1.60	— 1.47	— 1.35	— 3.14	— 1.14
36						
37						
38	F	F	F	— 4.75	— 1.67	— .34
39	— 5.01	+ .58	— 1.90	— 3.29	— 4.51	— .22
40				F		
41						
42	F	F	F	F	— 6.39	— 7.06
43	F		F		F	F
44	— 11.00	— 6.60	— 5.00	— 8.40	— 2.67	— 5.67
45	— 11.00		— 17.00	— 19.00	— 4.84	— 5.01
46	F	F	F	— 3.82	F	F
47	F	— 13.00	— 4.80	— 6.00	— 3.58	— 1.39
48	— 8.57	— 13.00	— 5.65	— 8.75	— 1.69	— 3.77
49	— 12.00	— 60.00	— 14.00	— 14.50	— 1.51	— 1.71
50	F	F		F	— 4.29	
52	F	F	F	F	F	F
53	F		F	F		
54	— 10.00	— 16.60	— 5.65	— 8.15	— 2.14	— 6.08
55	F		F	— 4.87	— 4.24	— 6.48
56	F	F		F	— 5.01	— 6.95
57	F	F	F	F		F
58	— 5.71					F
59	— 5.71	— 40.00	— 5.87	— 6.75	— 2.73	— 1.67
60	F	— 70.00	— 17.00	— 18.00	— 4.84	— 3.01
61	F	F	F	F		



No.	Part-Whole.	Genus-Species.	Opposite. 1st.	Opposite. 2nd.	Memory (unrel.).	Memory (rel.).
62	— 1.00	0.00	— 15.50	— 14.50	+ .17	— .44
63	— 4.14	— 15.75	— 4.84	— 6.87		
64		— 1.04	F	— 6.52	— 5.07	— 4.32
65	+ .01	— 1.74	— 4.88	— 4.86	— 8.47	— 4.69
66	— 1.27	— 14.60	— 5.47	F	— 3.05	— 10.80
67	— .17	— 6.71	— 4.03	— 3.38	— 3.67	— 4.67
68	— 9.00	— 30.00	— 5.43	— 7.50	+ 1.43	— 3.16
69	+ .71	— .60	— 4.78	— 8.65	— 6.01	— 3.01
70	— 4.27	— 15.00	— 5.43	— 7.75	— 2.61	— 8.39
71	— 4.27	— 15.75	F	— 7.97	— 4.37	— 4.34
72	0.00	+ 1.00	— 4.39	— 6.30	— 3.05	— 1.47
73	— 2.57	— 9.60	— 4.82	— 7.45	— 3.51	— 7.62
74		— 2.65	— 2.93	— 3.78	— 2.07	— 2.39
75		— 9.60	— 5.91	— 7.45	— 4.41	
76		F	F			
77	— 18.00	— 75.00	— 18.00	— 19.00	— 4.84	— 3.67
78	— 1.00	— 15.00	— 14.50	— 13.00	— 4.01	— 1.01
79	— 1.50	F	— 4.39	— 7.30	— 1.69	— 3.01
81	+ .20	+ 1.33	— 2.53	— 1.94	— 3.27	— 2.88
83	+ .20	— 9.00	— 3.47	— 7.25	0.00	+ .53
84	— 10.00	— 60.00	F	— 8.00	— 4.01	— 6.34
85		— 3.25	— 4.54	— 5.81	— 3.01	— 4.15
86	— 5.71	— 18.25	— 4.42	— 5.67	— 3.11	— 3.12
87	0.00	— 6.60	— 5.00	— 6.65	— 3.06	— 5.31
88	— 2.14	— 3.25	— 2.83	— 4.05	— 1.87	— 2.94
89	— 5.71	— 7.00	— 5.37	F	— 5.94	— 3.61
90	— 5.71	— 10.00	— 5.65	— 8.25	— 4.01	— 4.34
91	— .30	— 3.69	— 4.26	— 5.46	— .27	— 4.12
92	— 1.80	— 2.00	— 3.68	— 2.89	— 3.27	— 3.94
93	— .71	— 20.00	— 3.60	F	— 5.72	
95		0.00	— 11.50			
96		— 40.00	— 19.50			
97		— 15.00	— 16.00			
98	0.00	— 10.00	— 11.50	— 11.00	— .72	— 2.11
99	— 3.11					
100		F	F			
101	— 4.27	— 20.75	F	— 7.86	— 3.91	— 4.73
102						
103	— 3.00	— 50.00	— 17.00	— 18.00	— 4.29	— 2.11
104	— 14.00	— 50.00	— 18.00	F	— 5.01	— 5.79
105	— 14.00	— 45.00	— 18.50	F	— 2.86	— 5.27
106						
107	— 2.00	— 5.00	— 14.50	— 12.00	+ 1.43	— .53
108	— 4.75	— 10.28	— 3.50	F	— 3.78	— 3.56
109		— 6.00	F			
110			— 5.28			
111			F			
112	— 5.71	— 13.20	— 4.84	— 3.96	— 5.07	— 8.74
113	— .39	+ .71	— 3.65	— 5.58	— 5.01	— .63
114		+ 1.50	F			
115	— 5.71	— 15.75	— 4.69	— 7.37		

No.	Part-Whole.	Genus-Species.	Opposite. 1st.	Opposite. 2nd.	Memory (unrel.).	Memory (rel.).
116	— 7.00	0.00	— 17.00	— 17.00	— .72	— 2.64
117						
118	— 2.00	0.00	— 14.00	— 13.00	— .72	0.00
119	— 3.92	F	F	F	— 4.89	— 6.89
120	— 3.57	— 50.00	— 18.50	— 19.00	— 5.01	— 6.32
121	— 8.57	— 15.00	F	F	— 3.96	— 7.62
122		F	F			
123						
124						
125	— 7.00	— 60.00	— 17.50	— 16.00	— 1.43	— 2.64
126						
127	0.00	— 3.40	— 4.92	— 5.92	— 3.74	— 3.69
128	— 4.00	— 10.00	F	— 18.00	+ 1.84	— 1.00
129	— 4.00	— 70.00	— 17.50	— 17.00	— 2.86	— 3.16
130	0.00	0.00	— 10.50	— 5.00	+ 1.43	— 1.06
131						
132	— 12.00	F	— 17.50	— 18.00	— 2.86	— 2.64
133	— 3.92	— 10.28	F	F		
134	— 5.71	— 16.60	— 4.82	F	— 4.87	— 6.08
135	+ .71	— 1.00	— 2.47	— 2.10	— .82	+ .85
136	— 1.00	— 12.00	— 17.00	— 13.00	— .67	— 2.34
137						
138		F	F			

*Moral Imbeciles.*

51	— 3.58		— 2.96	— 4.77		— 5.89
80	— 1.42	— 9.00	— 3.65	— 6.00	— .78	— 2.24
82	— 1.63	— .01	— 1.56	— 2.31	— .39	— 2.28
94	— 1.22				— 3.65	— 2.95

TABLE XXXI.

No.	Pulse.	Temp.	Wt. Test.
1	+ 1.46	— .25	— 5.54
2	+ .77		F
3	+ 1.92	— 2.00	— .67
4	+ .06	— 1.00	— .49
5	+ 2.85	— 3.00	— 3.48
6	— 2.74	— 3.00	— 4.71
7	— .64	— 3.25	F
8	+ 3.55	+ .50	— .73
9	+ .06	0.00	+ .14
10	+ .06	— .75	+ 1.74
11	+ 2.16	— .75	— 3.14
12	+ 2.85		F
13	+ .06	— 1.00	— 3.25
14	+ 1.31	— 1.75	— 3.74
15	+ 1.31	0.00	— 4.36
16	— 1.81	— .25	— 2.64

No.	Pulse.	Temp.	Wt. Test.
17	+ .06	— .25	— 1.15
18	+ .76	+ .25	— 1.18
19	+ .76	+ .25	F
20	— .64	+ .25	— 1.39
21	+ .06	— 2.00	— 3.26
22	+ 2.85		— 1.44
23	+ 1.31	— 2.75	— 2.85
24	+ .06	— 1.00	— 4.62
25	— .64	— 2.00	— 6.75
26	+ 2.85	— .25	+ 1.61
27	— 1.34	— .50	F
28	— .64	+ .25	— .79
29	+ .06		— .71
30		+ 1.51	
31	+ 2.16	+ .25	F
32		— .50	
33	+ .06	+ .75	+ 2.05
34	+ 1.46	— .50	— 7.85
35	+ .06	— 1.50	— .77
36	+ .06	— 6.00	F
37	+ 1.46	— .75	— 3.72
38	+ 1.46	— 4.25	+ 1.24
39	+ 2.86	+ .50	— 2.21
40	— 2.74	0.00	+ 1.65
41	+ .06		— 14.47
42	+ .12	— .75	— 11
43	+ .25		F
44	+ .76		— 2.51
45	0.00		— 11.50
46	— 1.67	— 3.00	F
47	— 1.31	— 1.25	— 3.54
48			
49	+ .60		— 5.00
50	+ 3.25		— 12.44
52			
53	0.00		+ 1.42
54	— 1.31	— 3.00	— 1.71
55	— 1.31	— .75	+ 1.11
56	— 2.74	— .25	— 6.54
57			
58	+ 1.00		— 2.25
59	— 2.04	— 2.00	+ 1.23
60	— 1.20		— 1.87
61	— 1.59	— .50	
62	— 1.40		— 1.42
63	— .60	0.00	+ .39
64		— 1.00	— 3.74
65	— .99	— 2.75	— 4.04
66	+ 1.52	— 1.00	— 1.32

No.	Pulse.	Temp.	Wt. Test.
67	-1.08	- .75	- 9.71
68			
69	-2.27	-4.75	- 2.27
70	-2.00	+ .75	- 4.78
71	- .42		- 6.74
72	-3.65	- .50	+ .39
73	- .11	- .25	- 4.28
74	- .72	+ .50	- .08
75	-3.65	0.00	+ .84
76	-1.79	0.00	- 1.12
77			-10.33
78	-3.17	-3.25	-16.50
79	-1.11	- .75	- 1.34
81	+ .30	+ .75	+ .28
83	-5.37	- .50	- .56
84	- .42	-1.75	- 4.27
85	- .72	- .75	+ .74
86	-1.55	0.00	- 2.97
87	+ .39		- .74
88	- .76	0.00	- 7.31
89	+ .25	-1.00	- 5.31
90	- .74	+ .25	-13.08
91	0.00	+ .75	+ 1.16
92	-1.23	0.00	- 3.11
93	+ .37	- .50	- 6.86
139	-4.97		- 3.41
140	- .50	-3.25	
141	+ .12	0.00	
142	- .64	+ .75	
143	- .62	- .25	
144	+ .12	- .75	- 3.38
145	- .50	+ .75	- 2.34
146	- .50	-1.50	+ .78
147	-2.01	-3.25	F
148		-1.75	-12.75
149	+1.75		- 1.16
150	+ .84	+ .75	- 3.47
151	+ .12	-1.00	- .86
152	- .50		F
153	+ .18		F
154	+ .76		F
155	+2.16		F
156	-1.34		F
157	+ .06		- 1.51

*Moral Imbeciles.*

51	-1.31	-1.00	- 8.73
80	-1.87	-1.00	+ 1.23
82	-3.70	- .25	+ .78
94	- .12	-1.00	+ 1.40

TABLE XXXII.

No.	Intelligence.	Memory.	Maturity.	Total.
1	— 1.62	— 1.75	— 3.36	— 2.31
2				
3	— 2.59	— 2.91	— 1.70	— 2.22
4				
5				— 4.59
6				
7				
8		— 1.75	— 2.77	— 2.70
9				— 1.12
10	— 6.63	— 5.92	— 2.01	— 4.15
11				— 2.50
12				
13		— 1.46	— 1.71	— 1.67
14	— 1.62	+ .01	— 1.64	— 1.27
15				— 2.81
16				— 2.82
17	— 1.77	+ .04	— 1.15	— 1.16
18				— 2.31
19				
20			— 2.13	— 2.98
21		— 2.24	— 3.24	— 2.91
22				
23	— 4.06		— .70	— 2.77
24	— 3.80		— 2.75	— 3.02
25				— 3.75
26	— 3.29	— 2.80	— .94	— 2.16
27				
28			— 1.70	— 2.54
29			— 3.53	
30				— 5.02
31	— 1.26	— 1.50	— 1.46	— 1.41
32	— 3.00	— 1.54	— .20	— 1.43
33	— 2.88	— 2.77	— .58	— 1.61
34	— 3.28	— 1.83	— 3.21	— 2.70
35	— 1.11		— .50	— .84
36				
37				— 2.11
38			— .04	— .67
39	— 2.40	— 1.11	— 2.29	— 2.10
40				— 3.13
41				— 10.63
42		— 5.74	— 2.59	— 3.47
43				
44	— 7.50	— 4.58	— 2.76	— 5.12
45	— 15.66	— 4.00	— 8.17	— 10.15
46				— 4.41
47	— 7.93	— 3.40	— 2.69	— 4.01
48	— 8.99		— 2.84	— 6.50

No.	Intelligence.	Memory.	Maturity.	Total.
49	— 22.62	— 2.35	— 3.25	— 13.96
50			— 8.36	
52				
53				— 6.86
54	— 10.10	— 4.70	+ .36	— 4.80
55		— 4.93	— 2.82	— 3.72
56		— 5.35	— 5.32	— 5.33
57				
58				— 5.58
59	— 14.58	— 2.98	— .75	— 8.23
60		— 4.40	— 3.35	— 17.21
61				— 3.76
62	— 7.75	— .13		— 4.79
63	— 7.90	— 3.73	— 2.75	— 5.65
64	— 3.78	— 4.43	— 4.35	— 4.20
65	— 2.46	— 6.22	— 5.62	— 4.57
66	— 7.11	— 6.93	— 4.02	— 6.21
67	— 3.57	— 4.17	— 6.42	— 4.77
68	— 12.98	— 2.48	— 2.57	— 7.24
69	— 3.33	— 1.54	— 4.60	— 3.48
70	— 8.11	— 5.50	— 3.69	— 7.41
71	— 9.66	— 4.35	— 3.30	— 5.89
72	— 2.17	— 2.26	— 2.54	— 2.23
73	— 6.11	— 5.56	— 4.91	— 5.67
74	— 3.12		— 1.17	— 1.74
75	— 7.65	— 2.22		— 4.31
76				— 4.08
77	— 32.50	— 4.25		— 19.34
78	— 10.87	— 2.51		— 8.35
79	— 4.39	— 2.35	— 2.75	— 3.58
81	— .73	— 2.06	— .27	— .82
83	— 4.88	— .73	— .75	— 2.39
84	— 26.00	— 5.17	— 5.31	— 13.28
85	— 4.53	— 3.58	— 2.52	— 3.42
86	— 8.51	— 3.11	— 1.99	— 5.13
87	— 4.56	— 4.18	— 3.72	— 3.72
88	— 3.06	— 3.47	— 4.19	— 3.60
89	— 6.36	— 5.30	— 4.73	— 5.29
90	— 7.40	— 5.82	— 5.81	— 6.55
91	— 3.67	— 2.19	— 1.68	— 2.71
92	— 2.59	— 4.01	— 2.12	— 2.47
93	— 9.00		— 5.23	— 7.36
95	— 7.90			
96				— 19.93
97				
98	— 8.10			— 5.88
99				
100				
101	— 10.99	— 4.32	— 4.21	— 7.67
102				
103	— 22.00			— 15.73

No.	Intelligence.	Memory.	Maturity.	Total.
104	— 27.33		— 4.77	— 16.22
105	— 25.83			— 17.12
106				
107	— 8.50			— 5.51
108	— 6.17	— 3.67	— 2.46	— 4.50
109				— 4.73
110				— 2.44
111				
112	— 6.93		— 4.85	— 6.37
113	— 2.22		— 4.05	— 2.52
114				
115	— 8.35			— 7.90
116	— 10.25			— 7.93
117				
118	— 7.25			— 4.92
119		— 5.89		— 5.91
120	— 22.79		— 3.95	— 13.65
121	— 11.78	— 5.79		— 8.94
122				
123				
124				— 2.31
125	— 25.12			— 17.42
126				
127	— 3.56		— 3.51	— 3.55
128	— 10.66	+ .42		— 6.48
129	— 27.12		— 4.54	— 14.43
130	— 3.87			— 2.52
131				
132	— 15.83			— 10.60
133				
134	— 9.04	— 5.47		— 7.34
135	— 1.21	+ .01		— .70
136	— 10.75			— 8.00
137				

*Moral Imbeciles.*

51	— 3.77	— 5.41	+ .05	— 2.67
80	— 5.01	— 1.51	+ 1.15	— 2.17
82	— 1.39	— 1.33	— .78	— 1.32
94	— 5.75	— 3.30		— 1.96

The figures in the tables printed above contain the results of this investigation, and answer, in part at least, the questions raised at the beginning. They seem to point to the following general conclusions:

(1) The mental defects among idiots are by no means equaled by the bodily. In fact, in measurements of height and weight the defectives are indistinguishable from ordinary children.

(2) In general, at least as far as intelligence is concerned, idiots do not form a separate species, but simply occupy a position at the

extreme of some large distribution, probably approximately that expressed by the normal probability curve.

(3) Among idiots there is not an equal lack of mental capacity in all directions. There is something of the same lack of correlation among the traits measured in the case of idiots as there is with ordinary people.

As I have already stated, these conclusions are drawn directly from the tables of measurements, but in order to make clear the fact that the figures warrant these conclusions I will take them up one at a time and show the way in which each was reached. The first point is that the mental deficiency of the idiots as compared with ordinary children is in no way equaled by bodily deficiency.

### § 12. *Results Bearing on Physical Status*

THE following table gives the comparison of defectives with children in general, in terms of the percentage of each in the measurements taken which fall above a given point.

For normal children 50 per cent. will fall above the median and 50 per cent. below in every test; 75 per cent. will fall above — 1 P. E. and 25 per cent. below, and 91 per cent. above — 2 P. E.

TABLE XXXIII.

	DEFECTIVES		
	Per cent. above Median for Ordinary Children	Per cent. above — 1 P. E.	Per cent. above — 2 P. E.
Height (7)	45	61	77
Weight (8)	44	66	77
Pulse (9)	49	69	86
Temperature (10)	26	59	77
Weight test (13)	18	28	39
A test (1)	9	18	34
a-t test (2)	1	14	28
Memory of unrelated words (4)	6	18	27
Composite of 13, 1, 2 and 4	1	15	27
Dictation (14)	10	10	21
Memory of related words (3)	5	19	30
Composite of 14 and 3	7	10	24
Part-Whole test (6 B)	9	17	27
Genus-Species test (6 C)	9	16	17
First Opposite test (6 A I)	0	.9	5
Second Opposite test (6 A II)	0	1	7
Composite of 6 B, C, A I and A II	0	1	10

It is evident from these figures that in the measurements of height and weight the defectives almost reach the standard of children in



general, there being only 5 per cent. and 6 per cent. less of the defectives at the median point than of school children. In the tests of memory and of intelligence<sup>1</sup> only 10 per cent. and 5 per cent., 9 per cent. and 0 per cent., respectively, of defectives reach the 50 per cent. grade of the other children. The same thing holds true if we notice in each case the percentage of those above minus once the P. E. and minus twice the P. E. In the physical measurements there are about 4 times as many defectives above — 1 P. E. and about 2.5 times as many above — 2 P. E. as there are in the memory and intelligence tests. Without doubt there is a decided difference between the bodily and mental deficiency.

The same facts are emphasized by the following graphic representations. In every surface the zero point represents the median for school children in general; the figures on the right of the zero point are positive multiples of the P. E. and those on the left are negative multiples. Therefore the children whose grade is indicated on the right of the zero point are above the standard for children at large in that particular measurement and those occurring on the left of that point are below the ordinary ability. The figure at each point shows how much above or below ordinary ability in multiples of one tenth of the P. E.

Figs. 6, 7 and 8, which show the distributions for the physical measurements of height, weight and pulse rate, show clearly that the distributions are almost normal, the curves following pretty closely the usual probability curve, the cases clustering about the zero point, *i. e.*, the median of the distribution of cases in general. On the other hand the curves 14 to 23 inclusive, which show the distributions for memory and intelligence, are anything but normal, being decidedly skewed towards the negative end.

These facts, then, seem to justify the conclusion before mentioned and to show that whatever idiots may be on the mental side, as far as concerns physical conditions of growth, nutriment, etc., they are not far from ordinary children. 'The evidences of constitutional weakness, of slow growth and of inferior size,' which by many are held to be characteristic of mental deficiency, do not appear. These children were certainly not two inches shorter and nine pounds lighter than children in general.

It may be objected that the idiots examined were a selected group and that is the reason for the high results. True, the very worst idiots were not included in these measurements, those poor wretches so deformed that they can neither walk nor stand, but on the other

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<sup>1</sup> I use this word rather loosely, as these tests may not be any more of a measurement of 'intelligence' than some of the others used.

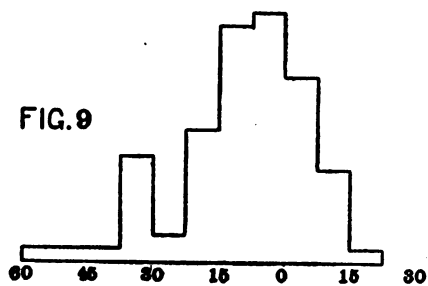
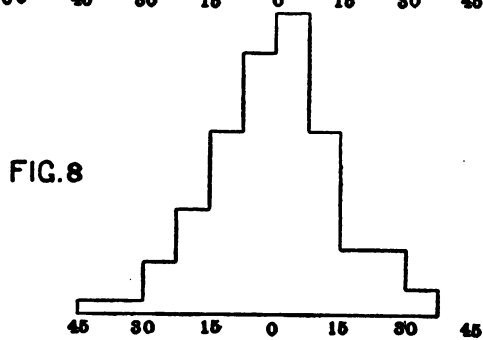
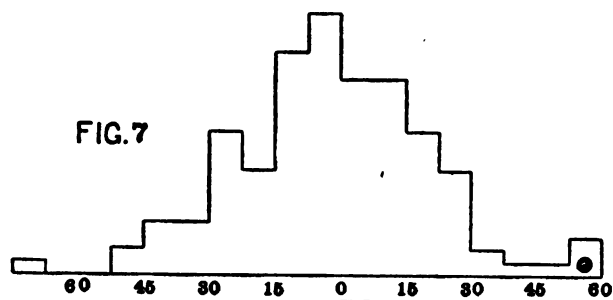
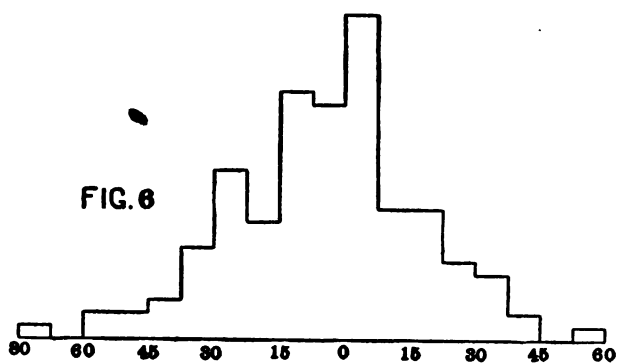


FIG. 6. Height.

FIG. 8. Pulse.

FIG. 7. Weight.

FIG. 9. Temperature.

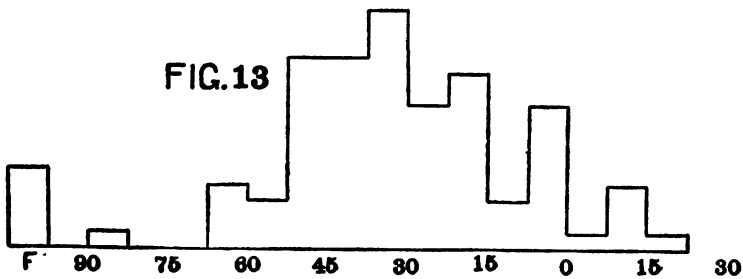
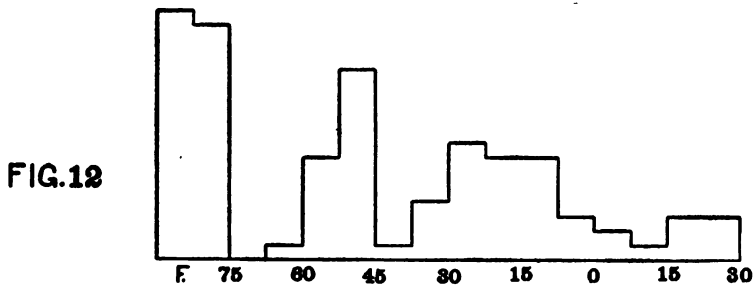
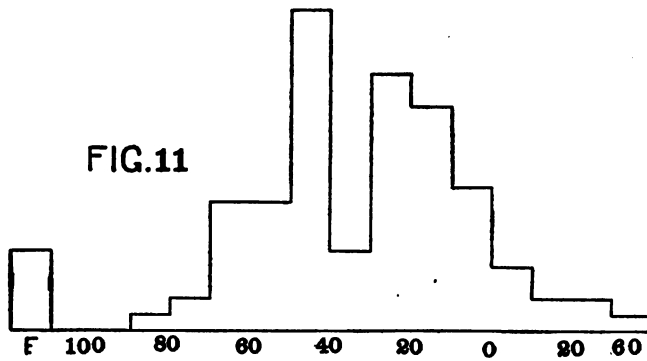
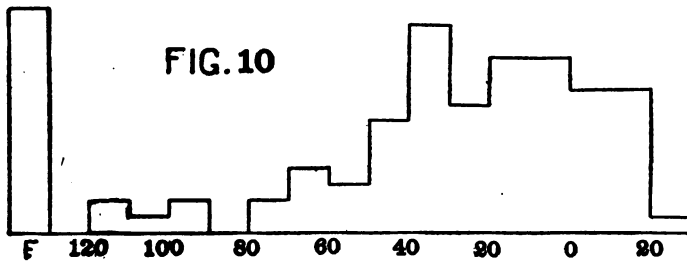


FIG. 10. Weight Test.

FIG. 12. A-T Test.

FIG. 11. A Test.

FIG. 13. Memory Test (1). Unrelated Words.

FIG.14

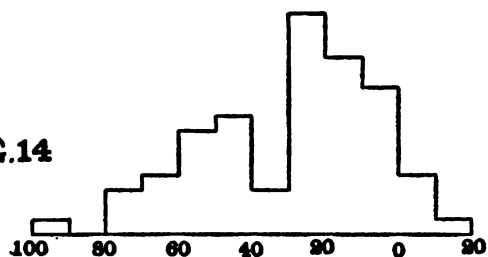


FIG.15

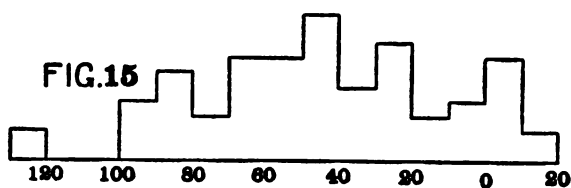


FIG.16

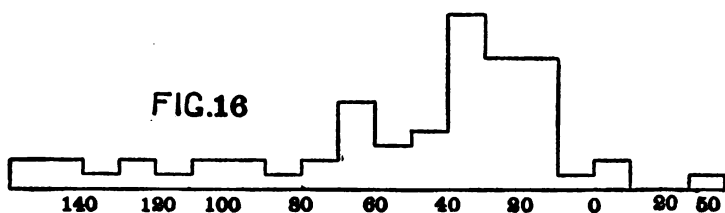


FIG.17

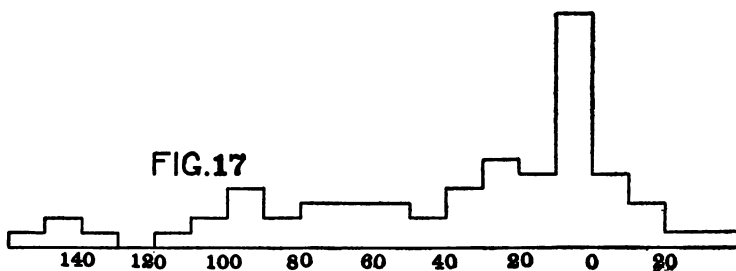


FIG. 14. Dictation Test (1).

FIG. 16. Dictation Test (3).

FIG. 15. Dictation Test (2).

FIG. 17. Dictation Test (4).

FIG.18

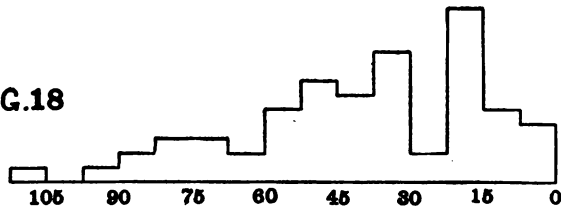


FIG.19

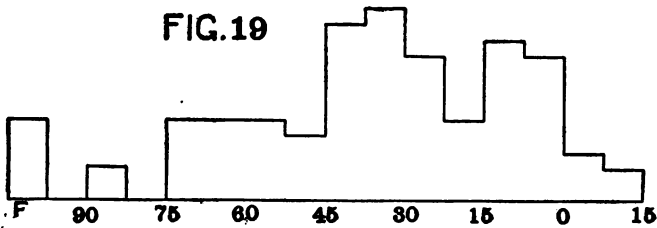


FIG:20

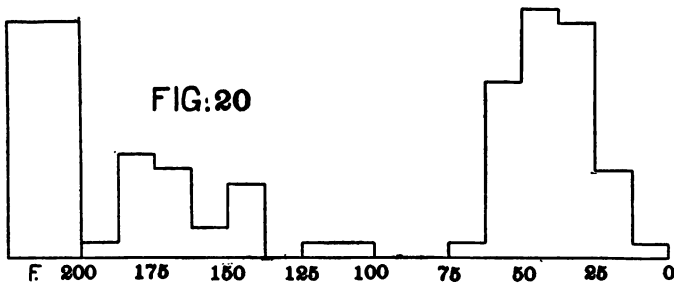


FIG.21

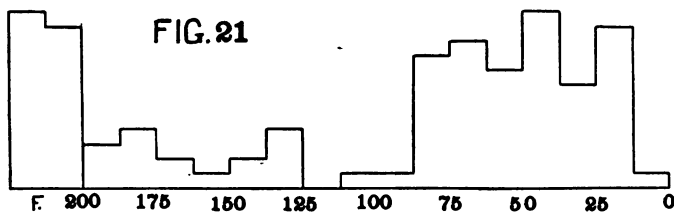


FIG 18. Dictation Tests. Composite of All.

FIG. 20. Opposite Test (1).

FIG. 19. Memory Test (2). Related Words.

FIG. 21. Opposite Test (2).

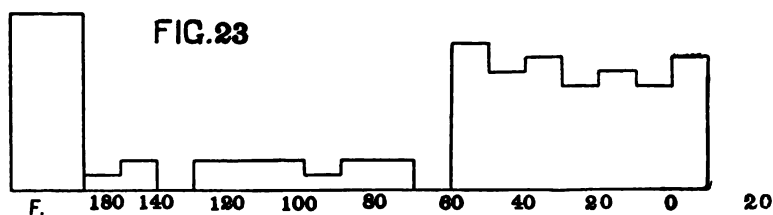
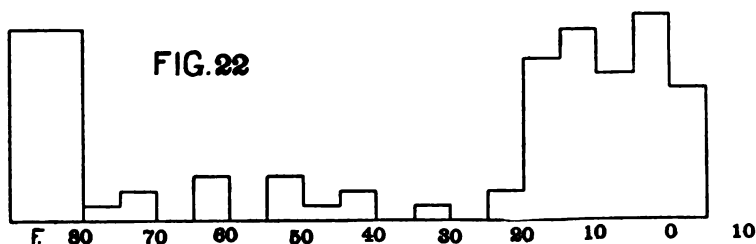


FIG. 22. Genus-Species Test.

FIG. 23. Part-Whole Test.

hand neither are all ordinary children examined in obtaining standards for height, weight and other physical measurements. Only the school children of the several cities were measured and weighed when the standards for 'normal' children were obtained, and of course those children who are all right mentally but who are deformed and diseased physically do not so often go to school. In both instances school cases were examined, and to that extent both groups were selected and therefore the results are comparable.

It may be further maintained that although the results obtained are comparable to some extent, yet they do not represent the true state of the case, for the proportion of the mentally deficient who are physically defective and the proportion of ordinary children who are so afflicted are not at all the same. In the first place this has to be proven; at present it is merely a matter of opinion. In the second place those children who are both physically and mentally deficient are more likely to find their way to institutions than those who may be only mentally deficient. Parents will keep a child at home if he is physically able to move about and attend to his own wants even though he may be below par intellectually, whereas if he is physically as well as mentally deficient he is much more troublesome and consequently is more likely to be sent away. Therefore, even should it be proven that in institutions for the feeble-minded the proportion of

physical defects is greater than that found among ordinary school children, the point would not be proven.

It is rather interesting to note that mouth temperature seems more closely connected with the degree of mental efficiency than with physical health. The percentage of idiots that reached the median for other people in this measurement, as given by Table XXXIII. (page 68), was 26, which is rather more closely correlated with the mental than with the physical tests. Fig. 9 emphasizes the fact, for the curve of distribution is in shape more like those representing the distribution for intelligence than like those for height and weight.

In order to show this more clearly, I took the temperature of the 20 brightest girls from the third and fourth year classes of a large public school and 31 ordinary girls picked from the same classes, ranging in age from 8 years to 13 years and 6 months. These results with those gained from 38 mental defectives found in the same school and those gained from 55 idiots in institutions are shown in Table XXXIV.

From this table it may be seen that the average temperature of the four classes of children examined decreases, the idiots confined in institutions having the lowest average ( $97.4^{\circ}$ ). Only 28 per cent. of these defectives reach or exceed the 50 per cent. mark for the ordinary children, and only 5 per cent. reach the median for the bright children. High temperature does seem then to go slightly with mental ability. A number of writers, Ireland among them, have noted the fact that the temperature of idiots is lower than that of ordinary people. Prescott reports in the *Pedagogical Seminary*, Vol. IX., that of 10 children whose temperature was the highest out of 71, 80 per cent. ranked as excellent or good in school work, while of the 7 children whose temperature was the lowest, only 43 per cent. ranked even as good, which also seems to point to the conclusion mentioned.

The variation which I found in temperature was greater than I had expected, ranging from  $94.2^{\circ}$  to  $100^{\circ}$ . This may seem rather extraordinary and of course there may have been some error, but the temperature was taken twice in most instances—the second time after an hour's mental work—and still these very low ones stayed proportionally low. Five of the lowest changed as follows:  $94.2^{\circ}$  to  $95^{\circ}$ ;  $95^{\circ}$  to  $96.4^{\circ}$ ;  $96^{\circ}$  to  $94^{\circ}$ ;  $96.2^{\circ}$  to  $96.8^{\circ}$ ;  $96.4^{\circ}$  to  $96.4^{\circ}$ . In all cases the temperature as recorded was taken at the mouth, as I could not conveniently get the body temperature elsewhere, and it may be that the temperature recorded was simply local, that of the head, and that the general body temperature was higher. This

seems rather plausible as a theory in view of the fact that low temperature goes to some extent with low intellectual power, for in that case there might be less blood going to the head in the case of idiots than with ordinary people and consequently the temperature, though lower there, might, in other parts of the body, be more on a par with that of people in general.

TABLE XXXIV.  
TEMPERATURE AT THE MOUTH

	Bright	Ordinary	Defectives in P. S.	Defectives in Institutions
94.2 up to				1
4				0
6				0
8				0
95.0				1
2				0
4			1	0
6			0	0
8			0	0
96.0			0	1
2			1	3
4		2	2	4
6		0	1	1
8		0	0	0
97.0		1	0	0
2		0	3	2
4		0	1	3
6	1	3	1	3
8	0	2	0	3
98.0	1	2	4	7
2	1	2	3	6
4	1	7	4	3
6	2	3	4	4
8	0	3	3	5
99.0	2	0	6	0
2	3	1	2	3
4	2	3	1	5
6	2	2	0	
8	3		0	
100.0	1		1	
2	1			
Median,	99.3 +	98.5	98.5	98.1 +
Average,	99.2 +	98.4 +	98.3 +	97.4 +

On the other hand, these very low temperatures may be accounted for by the fact that the children may not have held the thermometer down closely against the tongue, but simply held it under the tongue rather loosely, or they may not have kept their



mouths shut tightly. I simply offer these as suggestions; so far as I know, the temperature was taken as it should have been.

The lack of correlation between pulse and temperature is rather surprising in view of the fact that physicians usually consider a rapid pulse as indicative of high temperature. This does not seem to hold here, for the pulse rate of the idiots was about that of people in general, 49 per cent. having reached the median of children in general, but the average for temperature was considerably below the median for other people. Of course the reason that they have been so correlated in people's minds is probably because both high temperature and rapid pulse occur in fever, but the connection between them is evidently not so close as has been supposed.

### § 13. *Results Bearing on the Continuity of the Species*

My second conclusion was that idiots seem not to form a special class or species, at least as far as intellectual traits are concerned, but that they are included as part of a large distribution. I use the terms 'special class' and 'separate species' in the same sense as writers on this subject in general have used them. A group of individuals forming a separate species in any trait would be a group clustering about a certain central point and lying in the main outside the distribution of ordinary individuals in that trait. Its cases would in the main lie over 5 P. E. distant from the median for ordinary people. Here then we have two factors concerned in the determination of a 'species'—form of distribution and spread of distribution. Considering the second factor first, Figs. 20, 21, 22 and 23, which show the distribution for those tests which we are inclined to designate as most closely connected with intelligence, do not fulfill the requirements of 'special species' from the standpoint of spread. In every test the cases run up to the median for ordinary children, and from Table XXXIII. (page 68) we see that more than 15 per cent. of the cases are included within the limits of normal distribution. Fig. 24, which is a composite of the four intelligence tests and shows the distribution of their averages for each child, illustrates the same fact.<sup>1</sup>

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<sup>1</sup> In making this average those cases of F were not considered at all, but only the tests in which the child had a grade of some kind were taken into account. This method was always followed in making an average. It would be interesting to know if the results would be the same had the F's been weighted. Of course, there are two possibilities in the weighting—to give the F a weight equal to the average of the grades received by that child in the other measurements, or to give the F a grade below the lowest grade received by any one in that test. This, however, has not been done as yet.

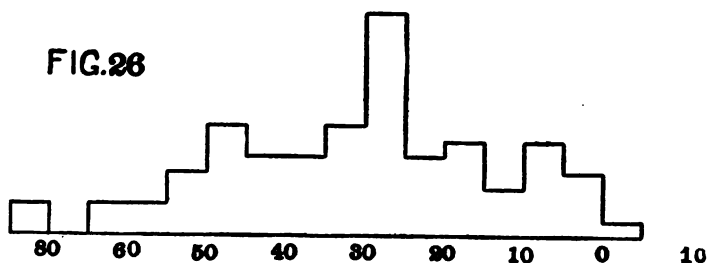
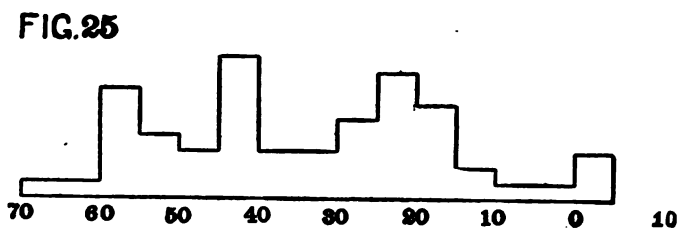
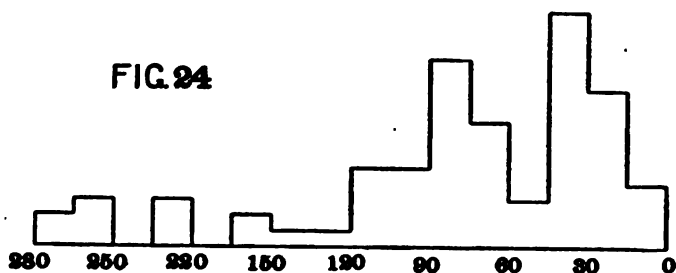


FIG. 24. Intelligence Tests. Composite of Tests 6 A I, 6 A II, 6 B and 6 C.

FIG. 25. Memory Tests. Composite of Tests 14 and 3.

FIG. 26. Maturity Tests. Composite of Tests 13, 12 and 4.

The grouping of any set of measurements always tends to throw emphasis on the norm and to eliminate individual variations, and that is what has happened in this case, and the conclusion can only be as stated that, overlapping the normal distribution as it does, this distribution can not be that of a special species. Figs. 14, 15, 16 and 17, which show the results of the individual dictations given in

test 14, Fig. 18, which shows these records combined, and Fig. 19, which shows the results of the test of memory of related words, all indicate that, from the standpoint of memory, there is no evidence of a special species. In some of the measurements the cases run as high as two and three times the P. E. above the median, and even higher in a few instances, while even in Fig. 25, which is the composite for the memory tests, the cases run a little above the central tendency of ordinary people. The results of the tests which I consider to be tests of maturity chiefly, point to the same conclusion. This is shown by Figs. 10, 11, 12, 13 and 26. The 'spread' of these surfaces and their overlapping of the corresponding surfaces for ordinary children then prove that there can be no separate species of idiots, at least in the traits examined.

Looking at the question from the standpoint of the form of distribution, we must arrive at the same answer. Going back to Figs. 20, 21, 22, 23 and 24, which show the distribution for the intelligence tests, no separate class or species could be represented by such surfaces as these. They show themselves plainly to be fag-ends of some larger curve. Of course the existence of such a large number of individuals who failed to do anything with these tests may be emphasized as a point against the conclusion on the ground that their presence in the surface might have changed its character. This objection will not hold, however, for such cases occur rather frequently among ordinary children and it has been found that when, upon a second trial, they have been made to understand the requirements, their records are scattered over a long distance on the scale, being in general low. Therefore, in this case we may presume that had the idiots understood what was wanted, their records would have been scattered over the lower part of the present distribution and hence not have materially affected the form of the surface. The surfaces showing the results of the memory tests, Figs. 14, 15, 16, 17, 18, 19 and 25, also show the absence of special grouping which would imply the existence of a species. The massing at the upper end of the surface is not so evident here as it was in the intelligence tests, but still there is nothing to point to the presence of a separate species. Glancing at the Figs. 10, 11, 12, 13 and 26, which show the results of the maturity tests, one might at first think that the form at least was indicative of a species. There is something that looks like a central tendency at a point three times the P. E. below the zero point. Still the fact that this point itself falls within the limits of the normal surface of distribution and the further fact that the cases spread down to — 8 P. E. make the existence of a special species extremely doubtful.

I made one other combination of results which in itself is practically valueless but which, taken in the light of the individual measurements shown, is of interest. Fig. 27 represents a composite of all the marks gained by each individual, save the physical measurements—height, weight, temperature and pulse. It contains more cases

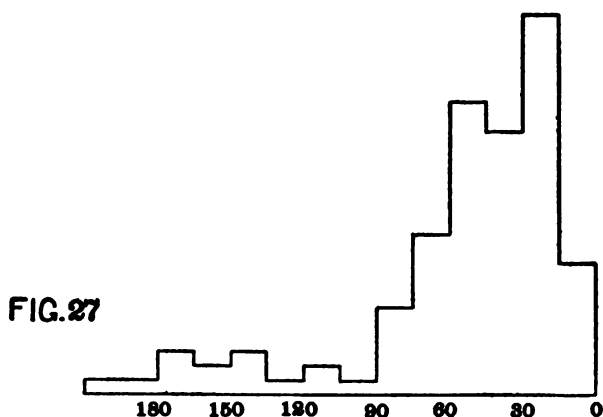
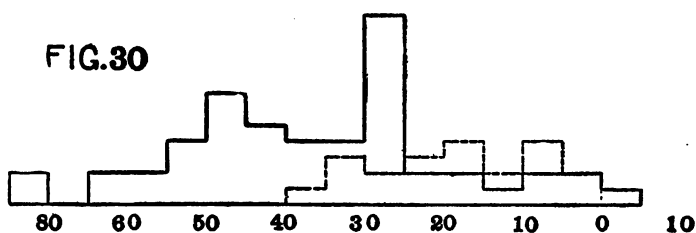
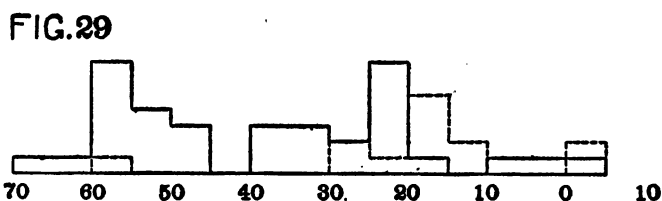


FIG. 27. Total. Composite of All Mental Tests.

than many of the other surfaces, for there were very few children who failed in every test right through. Of course the traits tested were so different that an average of all the results as expressed in such a curve is of little value. But it does show that so far as such a composite measure is valid, the defectives are not a separate species in the composite any more than they are in definite particular traits.

The question now comes up, "If these idiots do not form a special class, have we a right to say that they form the extreme of the ordinary surface of distribution." This is the view that has been supported by Galton, Ireland and Thorndike, although there seems to be no definite evidence. The fact already mentioned that the curves showing the distribution of idiots in the various measurements overlap the curves showing the distributions of ordinary ability, sometimes to such an extent that the upper limit is above the median, is strong evidence in support of the theory. In order to make the argument stronger, in the total mark for intelligence, memory and maturity, I separated the defectives found in the public school from those found in the institutions. Figs. 28, 29 and 30 show the results, the dotted lines representing the public school defectives and

the solid lines the institutional idiots.<sup>1</sup> It is very evident in Fig. 28 that the public school defectives occupy the position at the top of



PUBLIC SCHOOL AND INSTITUTIONAL CASES COMPARED.

FIG. 28. Intelligence Tests. Composite of Tests 6 A I, 6 A II, 6 B and 6 C.

FIG. 29. Memory Tests. Composite of Tests 14 and 3.

FIG. 30. Maturity Tests. Composite of Tests 13, 1, 2 and 4.

<sup>1</sup> The small number of cases in these curves is explained by the fact that a misunderstanding of one or two tests would throw a child's marks out entirely, as these records represent average marks and not single tests.

the curve, just below the zero point, all but one case fall above — 4.5 P. E. and none fall below — 7 P. E., while the other idiots rank as low as — 28 P. E. Now the fact that these defectives who fall near the central tendency of ordinary ability are those who are still in the public school, although in special classes, is significant. These children have been considered to fall at the extreme of normal children, in intelligence at least. They have not been considered defective enough to be sent to institutions but have simply been given more and different attention from that given to ordinary children. Their records, as shown by the surface, overlap the records of ordinary children and those of the idiots as well. They form the connecting link between children in general and those so defective mentally as to be confined in institutions. The position occupied by these school defectives in the curves representing the memory and maturity tests is similar to that for intelligence but is not quite so well defined. In each case they fall in the upper half of the surface and in general tend to be those near the zero point.

This additional proof strengthens the conclusion reached that idiots do not form a special class but belong to the ordinary distribution; and further that this distribution is a continuous one, there being no sudden break in ability, above which we find ordinary children and below which we find the idiot, but that the decrease in ability is gradual. It seems a steady progression from that of the ordinary child, through those special cases of mentally deficient children still retained in school, to those idiots found in institutions who can do most of the ordinary school work and seem to be not very different from children in general, on to those who can simply do manual labor and so down through all the gradations of complete idiocy.

#### § 14. *Results Bearing on the Generality of the Mental Defect*

THE third general conclusion was that there is not among idiots an equal lack of mental capacity in all lines. This fact has already been brought out in dealing with the first two questions, but a glance at Table XXXIII. (page 68) will serve to emphasize it. In the weight test there are 18 per cent. above the median for ordinary children, in memory 10 per cent. and 5 per cent., and in the intelligence tests 9 per cent. and 0 per cent. In the composites of these different series of measurements there are 27 per cent., 24 per cent. and 10 per cent., respectively, above — 2 P. E. This means that in going from the tests of maturity to those of intelligence we find an increasing number of idiots that fall below the standards for children

in general. Besides finding a greater number below the standard, the variability from that standard becomes greater in the intelligence tests and also the average ability as compared with the other children is lower. Figs. 24, 25 and 26 show the median for idiots in the intelligence tests to be about — 7 P. E., for memory to be — 3.5 P. E. and for maturity records to be — 2.7 P. E. The idiots are nearest the central tendency for children in general in the measurements of mental traits which are chiefly tests of maturity, and farther and farther away as measurements are made which are tests of ability to deal with abstract data. They are two and a half times as far from the median for children in general in tests like the opposite test or genus-species test as they are in tests like the A test or the perception of weight.

To speak of idiots then as being equally deficient in all the mental powers is false. 'Arrested mental development' must be taken to mean unequal arrests, some powers receiving a very much greater check than others. The feeble-minded child may be weak on all sides of his mental make-up (though this is not true of all of them), but that is not telling the whole story. From the point of view of the psychologist and the educator it is fully as important to know that the idiot's perceptive powers are almost two and a half times as strong and accurate as his intellectual powers and almost half as strong again as his powers of memory, as to know that he is weaker than the ordinary child in all these particulars.

There is one other point to be mentioned before leaving this aspect of the subject. I believe that in the tests of motor control, of perception of form and weight and the like, the case against the idiots is not so bad as it seems to be. In each one of the measurements of this kind that were taken, not one trait but a combination of traits, one of which was intelligence, was measured. In every case there were directions given and the understanding or lack of understanding of these directions had a very large influence on the result. I believe the main difficulty with these feeble-minded is just this lack of intellectual power and not so much inefficiency in perception, motor power, etc. The block test brings this out clearly and the maze test too; the children did not get the sense of the thing, did not realize what was wanted; and the results are correspondingly poor. Much has been written of the poor muscular control possessed by the idiot, but it may very well be that he stumbles about in walking and drops things so frequently simply because he does not know just where he is to go, or just what he is to do, because he is in a chronic state of indecision or of obstructed will. In other words the real motor or perceptive power need not be nearly so bad as it seems to

be, for the difficulty may be largely an intellectual one. Of course this can only be proved by experimental evidence which will differentiate between motor and intellectual ability; the evidence offered here does not pretend to do this. However, my opinion is that as we have found the idiot to be not far from the ordinary child as to the physical measurements of height, weight, etc., so we shall find that in motor control and perceptive powers he is not so far away as he seems to be, but that his ability decreases enormously when the power to deal with abstract ideas is considered.

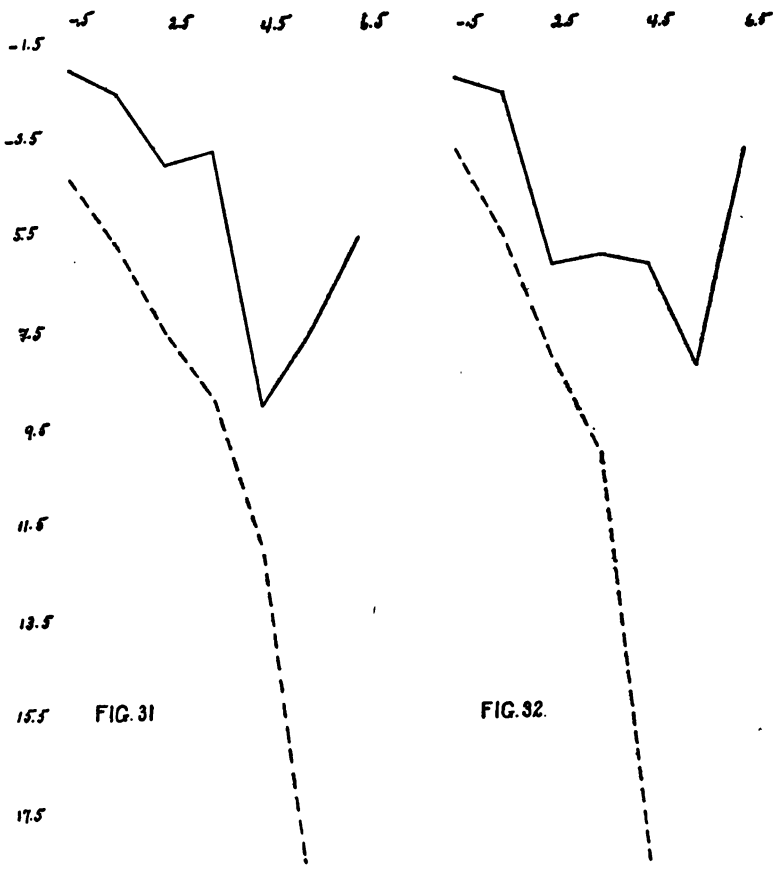


FIG. 31.

FIG. 32.

The question as to whether there is any correlation between the traits observed among idiots, might be raised. But the matter of correlation is rather difficult to handle when one is dealing with such extreme cases. The usual methods do not hold. Another difficulty in answering this question is the fact that my material is hardly



definite enough to warrant any decisive conclusion. However, the results seem to show about the same lack of correlation as is found when the question is investigated with regard to ordinary people. Were there really much correlation present we should expect it to come out rather clearly, as we are dealing with such extreme cases; but there seems to be comparatively little. The correlation of memory with intelligence is shown in Fig. 31, the solid line showing the relationship of the two as it exists and the dotted line showing what it should be were the correlation perfect. Fig. 32 shows the same for maturity and intelligence tests. At the upper end of the curves in each case the correlation is very much closer than at the lower. However, as I have already stated, not much can be said on the basis of this material.

#### § 15. *Improvement among Defectives in a Year's Time*

ABOUT a year after these tests were made, they were repeated for some of both the defectives and the ordinary children in order to see what changes and what degree of change had taken place in each class, and how far these changes were comparable. The children who were tested a second time were the cases in the Waverley School for Feeble-Minded and the group of nine-year-old ordinary children from one of the New York City schools. Each child was marked for every test and these records compared with his record of a year ago in the same test. If the marks were the same each time the improvement was rated at zero, a higher or lower mark on the second trial being indicated by a plus or minus mark in the improvement rating. The actual marks may be found in the Appendix, § 18, in Tables XXXVII. to XLI. inclusive. Each test was then considered by itself and the percentage of the total number of cases which had improved and the median amount of improvement for each test was found, both for the deficient and the public school children. A comparison of these final marks shows the relative improvement of each class in a year's time. Table XXXV. shows these results.

Comparing the amounts of improvement of the feeble-minded and the nine-year-old school children, we find that in two of the maturity tests the defectives improve more than normals, namely, in the A test, and in memory of unrelated words in which the respective ratings are 7.7 and 5.0 and + 1.7 and — 1.0. In the rest of the maturity tests the ordinary children improve more than the defectives. In the tests of memory, including the dictation work, the defective children improve much more than the other children, for their total record gives a change of + 4.4 and that of the others only + 0.3. That this change is a general one and not caused by

great changes in a few cases is shown by the fact that 53 per cent. of the defectives improved and only 43 per cent. of the other children.

TABLE XXXV.

	DEFECTIVES			NORMALS		
	Per cent. of Improvement	Median Improvement	No. of Cases	Per cent. of Improvement	Median Improvement	No. of Cases
Height,		+ 3.8	34			
Weight,		+ 3.0	33			
A,	80	+ 7.7	57	85	+ 5.0	14
a-t,	43	+ .9	56			
Rel. Memory,	46	+ .2	41	30	— 1.0	10
Unrel. Memory,	60	+ 1.7	43	29	— 1.0	11
Opp. First (class),	51	+ 1.2	47	69	+ 2.5	13
Opp. Second (class),	69	+ 2.7	46			
Genus-Species,	60	+ 1.6	50	92	+ 6.0	12
Part-Whole,	60	+ 1.7	43	92	+ 4.3	14
Weight Test,	36	0	28	68	+ 2.6	13
Opp. First (individual),	71	+ 3.0	30	69	+ 2.5	13
Dictation,	60	+ 4.2	28	57	+ 1.3	14
Maze; am't,	28	— 2.0	28	42	— 1.0	14
Maze; touches,	60	+ 5.0	28	35	— 9.5	14
Blocks,	55	+ 1.2	29	85	+ 10.0	14

In the intelligence tests the greater improvement is with the ordinary children although there is decided improvement shown by the feeble-minded. The average of the median of improvement in the four intelligence tests for normal children is + 4.3, while for the defectives it is + 0.8.

Looking at the whole series of tests, the contrast between the defective children and ordinary children is not so marked as might be expected; for in one half of the tests the former improved more than the latter and in the other half the reverse is true. In only two of the measurements do the defectives show no improvement whatever, while the ordinary children show the same lack in three of the tests. If the total amount of improvement in all the tests is considered the defectives have the advantage, 25.5 to 21.7. But this result is due largely to one measurement, in which the defectives have a mark of + 5.0 and the ordinary children — 9.5. Discarding this one test, the greater improvement is found to be with the ordinary children, 31.2 to 20.5.

Comparing the improvement of the defective children in one class of test with their improvement in others, we find that there is least improvement in the results of the intelligence tests, with an average improvement of 1.8; those of memory rank second with a mark of 2.2, while the greatest improvement is in the tests of maturity, the

average being 2.4. These figures show that the feeble-minded improve most in those mental traits in which they are most like the ordinary child and least in those traits in which they are most unlike.

In all this matter of improvement the case for the defectives may not be quite so good as it seems to be, for the standards which they first attained in the tests of maturity, memory and intelligence were far below those of ordinary children. For instance, in the first measurements only 1 per cent. of the defectives exceeded the median mark for school children in the maturity tests; 7 per cent. exceeded it in the tests of memory and 0 per cent. exceeded it in the tests of intelligence. With this state of things of course there was much greater room for improvement in the case of the defectives than there was for the public school children. Hence a unit of improvement for any of the former may have quite a different value from the same amount of improvement as found among the latter.

The obvious objection to these results as stated is that the comparison made is not a fair one, for nine-year-old normals have been compared with defectives of all ages from 7 to 17. However, the unfairness has probably been toward the defectives rather than toward the ordinary children, for the gain between nine and ten years of age is usually greater than the improvement between any other two years later on. This is especially true if the improvement between nine and ten years is compared with that between thirteen and fourteen. As it happens there are more of the defectives of thirteen and fourteen than of any other two years and there are only six nine years old or under.

The only right way to compare these two classes of children would be to compare equal numbers of the same age. As I had not the data to do this, my best way was (1) to get from the standards found in Tables VI. to XXIII. (see § 9) the amount of improvement shown in each test by normal children from year to year and (2) to weight each figure so obtained by the number of cases of defectives for that age. For example, in the A test the average number marked at eight years old was 30, and at nine years old 32.6: the improvement in a year's time would be +2.6. There are four of the defective children between eight and nine, hence +2.6 must be weighted by 4. Going through for each test in this way, we get a series of measurements of improvement comparable with those obtained from the defectives. The medians may then be reckoned from these measurements. The comparative records so obtained may be seen in the following table.

The results as presented in this table are rather startling, giving as they do a total improvement mark exclusive of the measurements

of height and weight of 24.1 to the defectives and one of only 8.7 to the same number of ordinary children of the same ages.

TABLE XXXVI.

	DEFECTIVES	NORMALS
	Median Improvement	Median Improvement
Height,	+ 3.8	+ 5.2
Weight,	+ 3.0	+ 8.7
A,	+ 7.7	+ 2.8
a-t,	+ .9	+ .9
Memory,	+ 1.1	+ .3
Opp. First,	+ 1.2	+ .5
Opp. Second,	+ 2.7	+ 1.0
Genus-Species,	+ 1.6	+ .1
Part-Whole,	+ 1.7	+ .2
Weight Test,	0	+ .6
Dictation,	+ 4.2	+ .3
Maze; am't,	- 2.0	+ 2.0
Maze; touches,	+ 5.0	0

However, there are some sources of error which reduce the validity of these figures. In the first place, the usual fallacy of selection is present; for children of a certain age are tested and then other children a year older are subjected to the same tests, with the idea that so we may find out what the first children will do a year later.

In the second place, when the defectives were measured the second time the same tests were used, hence it was a second trial and in some cases a third trial with the same tests, whereas in following the method stated above with the public school children the tests were only taken once. That a second and third trial do give an undue advantage, at least in some of the tests, the figures in Table XXXV. show.

In the third place, the units compared are not the same, for the level reached by some of the ordinary children in the first series of tests was very much higher than that reached by the defectives, hence the possibility of improvement in one case is much less than in the other. A mark of .1 improvement in the genus-species test for the public school children may be a higher mark than the 1.6 gained by the defectives. Is passing from 96 per cent. to 97 per cent. a less gain than passing from 70 per cent. to 75 per cent.? We do not know.

These sources of error make the figures stated unreliable so far as comparative value is concerned. They must serve simply as suggestions. Any one who can obtain records from ordinary children

for two successive years in the same way that I have from the defectives, will then have the data to furnish a reliable answer to this problem. However valueless these figures may be from a comparative standpoint, they have a very definite intrinsic value. They show definitely that the feeble-minded do improve from year to year and that their improvement is no mean one.

The results so far might mean that those defectives most like ordinary people go on improving and that those farthest from normal grow more and more unlike, resulting in a divergent series. To throw some light on this point the whole number of defectives from the Waverley Institution was divided into quarters according to their first marks in the intelligence tests. The first quarter was composed of those students having the highest marks; the second of those having the next highest, and so on in order to those possessing the lowest marks. The improvement in these same tests of each group was then found. The average improvement of the highest quarter was .8; of the second, 1.4; of the third, 1.7; and of the lowest, 1.0. Those defectives most like ordinary people have improved least. The lower half of the class has improved more than the upper half, the averages standing 13.5 to 11. The results are still more striking if one takes simply the extremes and considers the improvement of the best five in the group as compared with that of the worst. The average improvement of the best five is .6, while that of the worst is 1.9—three times as great according to the actual figures. Here, as before, it must be borne in mind that the units of improvement are not the same, consequently the figures measuring the two are not actually comparable. This, however, does not alter the fact that the defectives fairly low in the scale do improve decidedly in a year's time—that the improvement is not confined to those who most closely approach the ordinary.

The relative dependence of physical and mental growth has always attracted considerable attention from psychologists. The six defectives who for the past year grew at the most rapid rate were picked out and also the six whose rate of growth was slowest. The average improvements of these two groups in the intelligence tests were compared. The results are 1.6 for the former and 2.1 for the latter. Those who grew most slowly have the greater increase in intellectual ability. Limiting this comparison to children of the same age, and so taking the twelve-year-olds whose rate of growth was most rapid and comparing with them in improvement in intelligence those whose rate of growth was slowest, the results are more striking—.7 for the former, 2.5 for the latter.

The general conclusions—which of course are only tentative—of this study of improvement are then: (1) That among mental defectives a decided improvement in mental ability may be looked for after the lapse of a year, in some directions even exceeding that shown by ordinary school children. (2) That the greatest improvement is not confined to those defectives most like ordinary individuals. (3) That the improvement is not equal in all directions, but that some mental functions improve more rapidly and to a greater extent than others and that even the functions we designate as intellectual show a marked improvement.

One or two measurements were taken which, although they do not bear on this question of improvement, are interesting from an historical point of view.

When the temperature was taken the first time it was found that the defectives had, on the average, a lower temperature than the ordinary children. This result was corroborated by the second measurement. Another interesting fact was noted, namely, that in 72 per cent. of the cases the temperature was lower than at the first previous measurement, although at the close of an hour's mental work only 44 per cent. of the children had a lower temperature than that taken under the same conditions the previous year. Whether this fact is significant or what the cause for it may be, there is as yet no means of determining. The only difference in the conditions in which the measurements were made was a difference in season, as the first tests were made at the beginning of the winter and the second at the close. Since physicians in general do not note any difference in the temperature of normal individuals due to the change of seasons, it would be rash to suggest this as a cause.

The eyes of 44 of the defectives were tested by the use of Snellen's E test. The results are as follows: 48 per cent. could read the letter correctly at the distance specified; 52 per cent. could not. In giving this same test at the St. Louis Exhibition, Woodworth and Bruner found that the average ability of whites under twenty-five years of age could be represented by 1.68. As only 48 per cent. of the defectives could be given a grading of 1.00 the difference is very marked. Whether these results are comparable may be questioned, but certainly the results are suggestive. It has always been claimed that the sense organs of the defectives are very poor. In fact so fixed is this notion that it may cause surprise that these figures do not show the conditions to be worse.

In testing the sensitiveness of the skin of 29 defectives with an aesthesiometer the points of which were 20 mm. apart, the method

used in the Columbia Laboratory was followed. The child was told to close his eyes, and the points were pressed in the same order, sometimes 1 and sometimes 2 points being used, upon the same part of the back of the hand, namely, between the thumb and first finger. The results are as follows: Correct four or five times, 27 + per cent.; three, two, one or zero times, 72 + per cent. In the same test, the records from 250 Columbia students are: Correct four or five times, 63 per cent.; three, two, one or zero times, 37 per cent. This evidence supports the theory that the tactile discrimination of the feeble-minded is inferior to that of the ordinary person.

§ 16. *Application of the Results to the Subject Matter Used in the Education of Defectives*

THE foregoing conclusions offer some suggestions looking toward changes in the psychology and education of the feeble-minded. The difference in 'kind' as treated by so many writers reduces itself to a difference of degree of excellence in certain abilities, or perhaps to a difference in kind of treatment. Just as cripples, consumptives, anemic people, etc., though differing from ordinary people in degree of bodily health or strength and needing special kinds of treatment, are yet considered as belonging to the class of people in general, but as falling toward the lower end of a surface representing the health of all kinds of people, so we must consider defectives as differing from 'normal' individuals in the *degree* of ability in various fields, though needing, possibly, different *kinds* of treatment from that required by others. This difference in kind of treatment has been considered necessary by educators of the feeble-minded since the time of Seguin. Most of the emphasis has been laid upon the need of developing and training the physical side of the nature; it has been held that this bodily training is important because of its effect on the mental. Of course it is generally accepted that health of the body and health of the mind are closely correlated, that a poorly nourished body is a drawback to a certain extent to mental growth and development. Indeed, it is upon this theory that the physiological methods for educating the feeble-minded have been based. However, from the evidence as to the physical development of the defectives, presented earlier in this report, it would seem that there is not so much need for this kind of training as has been supposed. If these children are about as ordinary children in their bodily development, then they do not need any more of the physical development than do school children in general. And further, the plea for giving this gymnastic work was that it served as a spur on the

mental side as well. But if it is proven that from the standpoint of bodily health they do not need it—that is, do not need to have it emphasized—then it can not be much help on the mental side. A further argument in favor of this method has been that it not only developed the body but also increased the motor control and coordination of muscles and so developed mental control. If the seeming lack of muscular control is not so much a matter of muscles as it is a matter of mind, and if the benefit on the mental side from these exercises is gained because of the promptness and exactitude demanded in all class-gymnastic work, and is not a matter of muscular development and coordination, then it may be that this mental development could come just as well through some other means. The defectives probably need gymnastic work and physical training for the same reasons as any other set of children living the institutional life, but not because of any special lack of bodily health or development which is characteristic of them as a class.

The lower grades of mental defectives probably do need physical training—not for any effect it may have on the mental development, but for its own sake. In many instances the first thing necessary in the training of these children is to gain their attention, to arouse some sort of interest, and to this end the physical exercise offers the best means. Again in a custodial case when the end aimed at is simply cleanly habits and ability to care for himself, the prime requisite is that the defective have control of his muscles at least to some degree—an end reached by physical training. If, as has been suggested, the defectives have a lower temperature than normal, this sluggishness of circulation is the cause of all sorts of skin diseases, ulcers, boils, etc., and especially in winter weather, when outdoor occupation is at a minimum, physical training offers a means of stirring up the circulation through brisk exercise and therefore has a beneficial effect on the whole system. So far the contention has been physical exercise for its own sake, but there is one way in which the physical training may be a direct help on the mental side. Self-confidence brought about by success is absolutely essential to progress; continual lack of success must result in a static condition and finally in retrogression. The physical field is sometimes the one in which a child may gain his first success most easily—it may be merely the grasping of a dumb-bell, the fastening of a button, the climbing of one rung of the ladder or the keeping step with others. If this is true then it is the first step of progress on the mental side, the foundation-stone upon which self-confidence may be built, the touchstone of the child's ambition no matter how crude or elemental it may be.



To the extent that this is true, to that extent may the physical aid the mental training.

The field for the initial step, however, is not always the physical. It has been found that the social field offers great opportunities for the stirring up of dormant faculties or for the arousing of interests. Hence entertainments of all kinds, dances and displays form a large feature in the education of the feeble-minded.

Idiots seem to be like other children in the small amount of correlation that exists between various traits. Despite this apparent lack of correlation, public opinion insists that some individuals do excel in many ways and that some idiots are inferior in almost all directions. Some normal persons have at once quickness of perception, concentration of attention, wealth of associations and power in abstract and logical thinking in excess of their fellows, just as some of the idiots are far below their comrades in all these abilities. This fact may be explained by the great number and partial independence of the causes making human nature. In the millions of occurrences and combinations of mental and physical traits found among mankind, chance will account for a certain number of combinations of the best of each trait. And so by chance there should exist individuals who do excel in several, probably in many, abilities, and thus we have the genius. The same reasoning will account for all grades of intelligence down to the lowest idiot. Chance may cause the occurrence together of certain traits and the absence of others in such a way that the resulting mentality is that of the so-called feeble-minded. However, there should logically be more feeble-minded than 'eminent' men in the world, for disease must help in lowering a man's grade but it seldom helps to raise him in the scale of human intelligence. Among idiots, then, are all sorts of combinations of mental and physical traits just as there are among people in general, but the tendency of that combination is to pull them down to the lower extreme of human ability. As Ireland says, "Idiocy or imbecility comprehends cases quite distinct in etiology, pathology and treatment, which, however, unite to produce the deficiency of intellectual, nervous and muscular power." Perhaps it would be closer to the facts if it read, 'which, however, *may* unite to produce,' etc.

This fact of the lack of definite lines of division among idiots themselves and between idiots and people in general, is realized by many of those who have most dealing with them—those who practically live among them in the institutions. Dr. Fernald, of the Institution for the Feeble-Minded at Waverley, Mass., says "In theory the differences between these various degrees of deficiency are marked and distinct, while in practise the lines of separation are

entirely indefinite and individuals as they grow to adult life may be successively classed in different grades." These lines of division are hair lines and indefinite; if not, why do physicians disagree often as to whether a child brought to them for treatment is an idiot or not? There seems to be nothing peculiar and special which marks an idiot off from people in general and by which he can always be known. The traits of most value from a diagnostic point of view, namely, evidences of the lack of intellectual ability, are those which locate the individual at the fag end of the ordinary curve of distribution and consequently are those least likely to mark him out apart from others. If all the papers of the idiots tested were mixed with those of the school children, there would be nothing to mark them as those of a separate class. Were any one required to pick them out he would have to follow just the same method and judge in just the same way as he would do were he picking out the brightest among ordinary children or the mediocre or the dull. This idea probably comes as a shock to many, for we have used the words 'idiot' and 'feeble-minded' to designate an individual entirely apart from people in general and one so very different from other individuals as to be forever identified. But this is not so. I was very much surprised at the common sense, judgment and thoughtfulness of many of the children with whom I came in contact in the institutions.

This point of view must have some definite bearing on the general problem of the education of these children. The method most widely accepted is the one already mentioned, the physiological method, which was suggested by Seguin. Except for the strong emphasis which is placed upon the physical education, the method seems in general to be the kindergarten method as we know it in the public schools. As the idiots have been so often regarded as a special class, their education has come to be regarded as special too, being considered entirely distinct and different from that of ordinary children. It can be easily understood that this must be the case were the following views to be held in the extreme: "The memory is nearly always weak and unreliable. The faculty of observation limited within the more elementary lines and attention is both difficult to fix and hard to hold without unusual effort on the part of the teacher. The imagination is very crude. Such children are capable of the most meager abstract thinking, and their powers of judgment aberrant to a degree; they act impulsively, and without reason, because the fundamental principles of potentiality in this respect are inactive—inert."—Osborne. "Abstract ideas and intellectual perceptions are dull or wanting and the notions of foresight, prudence and self-preservation are deficient or feebly developed. The memory

is usually weak. . . . The power of attention is defective or often absent, as are the faculties requiring exercise of the will. . . . The judgment cannot be depended upon."—F. Beach.

But it seems that these children are *not* so very different from other children and that consequently there is no reason why their education need be. As Dr. Fernald points out, "As compared with the education of normal children, it is a difference of degree and not of kind. With these feeble-minded children, the instruction must begin on a lower plane, the progress is slower and the pupils cannot be carried so far." That the instruction must begin on a lower plane and that it must be of a kind that will appeal to the senses rather than to the intellect goes almost without saying. But whether, as the child grows older, it should retain that characteristic is another matter. Certain it is that the idiot is more easily reached by such training, but whether it is better for him in the long run and whether it is impossible to reach him in the same way that we do ordinary children, is not fully decided. If the idiot is simply at the extreme of the ordinary distribution of ability and is characterized by a sluggishness of disposition which may affect both mental and physical advance and development, then what he needs is stirring up, encouragement and, if need be, even forcing in the mental field as well as in the physical. Theoretically there may be no good reason why he should not have the intellectual work which is required of school children in general. It may have to be given a very little at a time, with more repetition, illustration and amplification, but still it could probably be of the same general character that we find in the best schools. Of course the objection is raised that idiots fail in appreciating abstract ideas; but so do a large percentage of ordinary children. How much do the school children really understand and appreciate of technical grammar or mathematical geography if taught in the grammar grades? Here again the difference is simply a matter of degree. It is very probable that could the idiot once be taught to write and read he might gain more and progress more quickly than he does by the present methods of education.

Theoretically there may be no objections to giving the feeble-minded something more of the intellectual training, but practically there may be. The main object in the education of the mentally deficient seems to be to fit him to become self-supporting. Although he might be able to do more intellectual work, yet he could never excel in the field of intelligence and would probably never be able to support himself by the pursuit of any occupation requiring much mental work. For the same reason, then, that in the public schools

Latin and Greek, technical grammar and much of mathematics are becoming of less importance, and manual training, domestic science and domestic art are being substituted for them—for the reason that the useful as well as the cultural side of life is more and more appealing to educators—for that same reason it may be well to cut out most of the intellectual work in the training of the idiot and emphasize the hand work. This is the method followed in many institutions; the industrial side in its various phases is emphasized. It may be this emphasis rather than any natural aptitude which accounts for the fact mentioned by Ireland, when he says, "It strikes us that a constructive or mechanical turn is more frequently preserved among idiots than any other gift." In some institutions we do find the feeble-minded studying physical geography, composition, music, painting and arithmetic, but in many, and among them some of the most advanced, it is the laundry, cooking and sewing for the girls and the carpentry, gardening and painting for the boys, to which most of the attention is given. As these individuals can never be leaders among men, it seems the best plan to have them learn a trade rather than to have them bother over the more intellectual kind of work. However, we should remember that this is probably a matter of expediency rather than one of necessity, and there may be much that is good on the other side.

It is certainly true that the more like ordinary people these feeble-minded are treated the more like people in general they will become. As they tend to be more immature than other children they are open to suggestion for a longer period of time. They should have schools, churches, entertainments, trades and the like, just as ordinary people do. They need not be mixed in with people in general, but in every case they should be made to feel as nearly like other people as possible.

#### § 17. *Application of the Results to the Methods Used in the Education of Defectives*

IN the present-day criticism of the modern educational methods are three points, which to my mind have vital bearing on the education of the feeble-minded in the field of physical, mental and industrial training. In the first place, our best educators believe that but a short time should elapse between an act and its result, and that in most cases the result should be definitely pleasurable if the act is a desirable one. The younger the child, the greater the force of this rule. Taking up the first point, if much time elapse between the act and the result, whether that result be pleasurable or painful, the

result has lost much of its efficacy, for the child has forgotten the act. If not completely forgotten, yet the impression is comparatively dim by reason of all that has happened between. A result to be of value as influencing a future act must be so closely connected with that act that the two ideas have to the mind something of the same vividness; and close sequence is the best means of securing this end. The second fact, namely, that pleasure should follow an act if that act is desirable, seems to be one of nature's fundamental laws. The simplest method, the animal method of learning, is the one which has been called 'the selection of accidental successes,' and the selecting factor is always pleasure. Animals learn to do a trick when some reward is offered, and the movements which bring the reward are the ones stamped in. If the result be indifferent the act is almost as likely to be obliterated as to remain. This method combined with imitation is the one adopted by children and if the results are to be successful the element of pleasure must enter in. When 'the act' becomes a mental one instead of a physical, the same law holds. Here the pleasure may be of a higher grade, a word of approbation, a smile, an extra piece of work to do, but reward in some form is essential. This rule holds good with the training of ordinary children and, therefore, must hold doubly true of these very children—the defectives. In all their training, physical, mental, moral or industrial, a reward of some kind must be forthcoming—the sooner the better if the act, whether chiefly mental or physical, is desired as a habit.

The second point of note is the influence brought to bear by the psychology of memory on our methods of teaching. The memory of any event or fact depends upon two factors, the native retentiveness of the brain substance itself and the number of associates which the particular fact has in terms of 'brain paths.' The former factor can not be improved. Every individual is limited so far as memory is concerned by the kind of brain with which he was endowed at birth. If it is easily impressed and also one which retains this impression, other things being equal, that person will have a good memory. This being true, it seems rather a poor way to improve the memory, either of ordinary children or of defectives, to employ the method of repetition, so endeavoring to hammer a fact home by mere brute force. The better method, certainly, would be to work along the line of the second factor determining memory, namely, to increase the number of associates. The more clues there are connected with any one fact, the more likely will it be that that fact will come to mind when wanted. Now this method seems particularly applicable to the defective class of children in the light of what we know of the brain development of the feeble-minded. Hammarberg found—

and no one has contradicted his statement—that the brains of defectives as wholes or in parts were poorly developed, not so much in the sense that the cells were smaller or necessarily ill shaped, but that they lacked the arborizations and the multitudes of associative fibers which go to make up a complex cortex, a cortex of the kind which is accompanied by intelligence. This fact of brain anatomy seems to be corroborated by the results noted in § 14, namely, that the greatest divergence in ability between ordinary and defective children was in the test of power of association. This, to my mind, is the test of intelligence—a very rough one, but one which will point out those individuals who fall at the extreme low end of human ability, those who fall in the class known as defectives. A dozen or more different traits have been pointed out by various writers as the essence of feeble-mindedness—lack of judgment, lack of will-power, lack of imagination, or lack of ability to look at consequences, besides the lack of ability to form abstract ideas, etc., etc. But the underlying cause of all these lacks is this inability to form associates. The specialization of this ability helps us to understand those defectives who are above par in some one particular branch. The knowledge of this fact helps in the training of these defectives. Physiology shows that a high rate of intelligence goes with a complex cortex, that the existence of many associations and the like is paralleled by an increased arborization; but which is cause and which is effect no one knows. However, we do know that any one may increase his memory in any line simply by increasing the number of associates in that field. The resulting suggestion is not to depend only upon repetition to fix facts but to let the same fact be met in a dozen ways instead of simply in one. Of course in the case of some of the lower grades of defectives the process would have to be very slow and very simple. But certainly what the defectives need is an increased power of association in its broadest sense; and when nature has provided two ways of securing such power, one of which is much narrower than the other, it behooves us to use both and certainly not to neglect the broader of the two.

The third point of modern criticism which was mentioned as particularly adapted to the defectives grows directly out of this and concerns the facts or associates to be given to the children in school. Shall we consider them simply as storehouses and pack away in their brains everything that they may possibly need at some future date? Or shall we consider them as living beings, living as children a life as full and rich as they ever will live as adults, and hence give them in school and home facts which they really need and in the way in which they will need them? As evidence that the second point of

view is the one which is being accepted more and more in our public schools, witness the presence of manual training, domestic science, nature study and the absence of much of the Latin, Greek and mathematics of fifty years ago. Psychology certainly supports this point of view. Interest and attention—and if attention then memory, understanding, appreciation, etc.—go hand in hand. Voluntary or forced attention is of value largely because interest may result—if it does not, the attention passes to something else. Now interest is dependent largely on use. ‘Consciousness is in its very nature impulsive.’ Anything that the child or adult needs—finds a use for—must of necessity be interesting; for it brings pleasure in some degree. The outcome of this must be, to preserve the child, of whatever degree of intelligence he may be, from dry facts for which he has no use, for to him they are not *facts*! They can only be artificial and his interest can not be in them to any degree; his attention must be forced and his understanding and memory of them must be superficial. Give him living facts, things that he is really wanting to know about—if necessary create or make felt the need, but by all means have the need and therefore the interest present! This perhaps is an extreme statement of the case for the ordinary child with our artificial requirements of modern civilization, but for the defective it is not extreme. It is the only possible means of progress for him. In his training let the facts which he gets, the habits which he forms, be living, vital ones; let everything function then and there—the sooner the better. Let the result be pleasurable as often as may be, so as to reach interest and through that medium the understanding.

The question which has always confronted the student of defectives and which still confronts him is ‘what is the ultimate end of the feeble-minded?’ The answer has been stated in decided terms by some writers—“We can not cure what is not a disease but a defect, and that which the cradle rocks the spade will cover.”—Barr.

But to-day we realize that between ordinary children and defectives there is a difference not of kind but of degree, that there may be every grade of deficiency, ‘passing insensibly into ordinary intelligence’—‘that the lines separating one class of deficiency from another are hair lines and artificial in the extreme.’ Hence we may feel that the case is not quite so hopeless. When we see the weak wills, poor imaginative powers, poor memories, inability to deal with abstract subjects possessed by people considered normal in the world to-day, the thought forces itself upon us that probably we are most of us defective in some field and to some degree. We believe that for us all there is a possibility of improvement, and so we find there

is hope for the defective. Few of us ever expect to reach the status of eminence, but some of us may; and so may some of those classed as feeble-minded or defective reach ultimately the class spoken of as normal. Some from the London defective classes have done so. For many of them, there must remain only custodial care on one hand, the colony on the other. It is all a matter of degree. The danger is to think that we definitely know the point which may be reached at the higher end. Until we know more about the psychology, the physiology and the chemistry of human life at its lower extreme, it is unwise to prophesy the possibilities.

Until then all we can do is to have as high ideals as are practical and to develop the individual to the highest possible standard—which standard must be discovered in the process, not determined upon beforehand—physically, mentally and morally.

In summing up this whole matter I would say that the difference between idiots and other people is one of degree and not of kind. The same difference exists between the very bright among school children and the mediocre, and between the mediocre and the stupid, as exists between the idiot and the ordinary person, and in some cases the former differences are greater in degree than the latter.

Consequently we must criticize the methods of educating idiots from the same standpoint and use the same arguments either for or against that we do in criticizing the methods and curricula used in the general education of the masses. They are not special and peculiar in any other sense than the one in which the dull, stupid child is peculiar when compared with the bright, quick child. What in education is not good for the idiot is probably not good also for at least 10 per cent. of school children at large.



# APPENDIX

## § 18. *Tables Showing the Improvement of the Defectives in a Year's Time*

TABLE XXXVII.

No.	Ht.	Wt.	A.	A.	a-t.	a-t.
62			+ 6.0		— 1.0	
63			+ 7.0	+ 8.0	0.0	0.0
64	+ 4.5	+ 2.0	+ 4.0	+ 11.0	0.0	0.0
65	+ 2.8	+ 10.0		+ 26.0	+ 5.0	— 7.0
66			+ 15.0	+ 9.0	— 1.0	— 6.0
67	+ 4.0		+ 5.0	+ 19.0	0.0	9.0
68	+ 3.3	+ 6.0	— 2.0	— 6.0	0.0	+ 5.0
69			+ 17.0	+ 3.0	+ 9.0	— 2.0
70			+ 26.0		0.0	0.0
71		— 21.0	— 9.0		0.0	
72					+ 12.0	
73			+ 16.0	+ 7.0	0.0	— 3.0
74			+ 25.0	+ 9.0	0.0	0.0
75			— 2.0		0.0	
76	+ 1.3	+ 1.6			0.0	
77						
80	+ 1.3	+ 2.5	+ 5.0	+ 11.0	— 3.0	0.0
81	+ 5.8	+ 15.0	+ 15.0	+ 13.0	— 1.0	+ 1.0
82			+ 11.0	+ 4.0	+ 13.0	+ 13.0
83			+ 8.0	+ 25.0	+ 10.0	+ 7.0
84			+ 18.0	+ 3.0	0.0	+ 4.0
85			— 2.0	— 1.0	+ 13.0	+ 8.0
87	+ .8	+ 1.4	+ 20.0	+ 19.0	0.0	+ 12.0
88	+ 3.3	+ 5.5	+ 15.0	+ 14.0	+ 10.0	+ 4.0
89	+ 2.5	+ 6.0	+ 16.0	+ 20.0	+ 6.0	+ 5.0
90			0.0	— 2.0	— 2.0	— 2.0
91	+ 5.1	+ 2.7	+ 7.0		+ 8.0	
92	+ 8.3	+ 10.5			+ 6.0	
93	+ 1.2	+ 6.0	— 12.0		+ 3.0	+ 7.0
94	+ 3.5	+ .1				
96	+ .5	— 1.1	+ 12.0		+ 13.0	
97			— 3.0		— 5.0	
98			+ 6.0	0.0	+ 5.0	0.0
99	+ 5.3	+ 5.5	+ 5.0			
100	+ 14.3	+ 3.1	— 2.0		— 2.0	
101	+ 4.2	+ 6.4	+ 21.0	+ 12.0	+ 14.0	+ 15.0
103	0.0	— 1.5	+ 1.0		+ 4.0	
104	0.0	— 2.5	+ 14.0	+ 33.0	+ 3.0	+ 8.0
105	— 1.2	— 7.0	+ 6.0	+ 8.0	+ 5.0	+ 5.0
106	+ 3.3	— 2.5	— 14.0			
107			+ 2.0	+ 9.0	0.0	+ 1.0

No.	Ht.	Wt.	A.	A.	a-t.	a-t.
108	+ 3.7	+ 2.1	+ 5.0	+ 6.0	0.0	0.0
109	+ 2.0	- 2.9	+ 12.0			
110	+ 2.0	+ 1.1	+ 1.0		- 11.0	
111	+ 1.2	- 3.0	+ 8.0		- 8.0	
112	+ 6.1	+ 2.0	+ 1.0	+ 13.0	- 3.0	- 1.0
113	+ 2.0	+ 6.0	+ 13.0	+ 15.0	0.0	0.0
114	+ 2.5	- .6	+ 22.0		+ 14.0	
115			+ 2.0	- 3.0	0.0	0.0
116			+ 10.0	+ 14.0	+ 4.0	- 2.0
117	+ 5.1	+ 4.0	- 1.0			
119	+ 4.6	+ 3.1	+ 9.0	+ 19.0	+ 1.0	- 3.0
120	+ .8	+ 3.0	- 19.0	+ 25.0	- 11.0	+ 3.0
124	+ 3.7	+ 4.20				
125	+ .8	- 3.5	+ 7.0	+ 1.0	- 2.0	+ 3.0
126	+ 4.8	+ 1.0	+ 9.0		+ 2.0	
127			+ 5.0	+ 8.0	+ 2.0	+ 5.0
128	0.0	+ 1.3	+ 8.0	+ 3.0	0.0	+ 5.0
129			+ 18.0	+ 11.0	+ 3.0	+ 5.0
130			+ 15.0	+ 35.0	+ 23.0	+ 4.0
131			+ 7.0			
132	+ .7	+ 2.5	+ 5.0	+ 20.0	+ 6.0	+ 5.0
133	+ 1.2	- .1	+ 7.0	+ 12.0	+ 2.0	
134	+ 7.5	+ 5.7	+ 8.0		0.0	
138		+ 1.8				

TABLE XXXVIII.

No.	Part-Whole.	Genus-Species.	Opposite. 1st.	Opposite. 2nd.	Memory. (rel.)	Memory (unrel.).
62	+ .5	- 2.0		+ 3.5	- 2.0	- 3.0
63	- 1.0	+ 2.0	- 1.0	0.0	- 4.0	0.0
64	- 2.0	+ 1.0	+ 1.0	+ 1.5	- 4.0	+ 3.0
65	+ 3.0	+ 8.0	+ 3.0	+ 4.5	- 4.0	+ 5.0
66	+ 2.0	+ 6.0	+ .5	+ 11.0	+ 2.0	+ 2.0
67	- .5	+ 3.5	- 1.0	- 2.0		
68	+ 4.0	- 1.0	+ 5.0	+ 3.5	0.0	- 1.0
69	- 2.5	0.0	+ 7.0	- 1.5	+ 2.0	+ 5.0
70	+ 4.0			+ .5		
71		- 1.0	+ 1.0		- 2.0	- 3.0
72		- 1.0			- 4.0	+ 5.0
73	0.0	+ 3.5	- 1.5	- .5	+ 5.0	+ 3.0
75		+ 4.5	+ 4.0		- 2.0	+ 5.0
76						
77		- .5	- 3.0		- 1.0	+ 2.0
80	+ 1.0	+ 5.0	+ 2.5	+ 2.0	0.0	- 2.0
81	+ 1.0	- 1.0	- 7.5	- 1.0	0.0	+ 1.0
82	+ 5.0	+ 1.0	- 8.0	+ 7.0	+ 6.0	+ 1.0
83	0.0	+ 1.0	- 3.0	+ 9.5	- 1.0	- 6.0
84	+ 3.0	+ 4.0	0.0	+ 8.5	+ 2.0	+ 2.0
85		+ 2.0	- 2.0	+ 9.5	+ 4.0	+ 6.0
87	0.0	+ 4.0	+ 8.0	+ 4.0	+ 4.0	+ 4.0

No.	Part-Whole.	Genus-Species.	Opposite. 1st.	Opposite. 2nd.	Memory. (rel.)	Memory (unrel.).
88	+ 2.5	+ 2.0	— 5.0	0.0		
89	+ 2.0	+ 1.5	— 1.0	+ 5.0	+ 1.0	+ 4.0
90	+ 4.0	+ 1.5	+ 6.0	0.0	— 3.0	— 2.0
91	— .5			+ 3.0		+ 1.0
92	+ 6.0	+ 8.0	— 2.0	+ 3.0	— 3.0	— 1.0
93	— 3.5	+ 1.0	+ 6.0	+ 2.0	0.0	+ 6.0
96		— 1.0	+ 1.5			
97		+ .5	— 1.0			
98	0.0	+ 1.0	— 1.0	+ 1.0	— 1.0	+ 2.0
100		+ 6.0	+ 4.0			
101	0.0	+ 7.0	+ 2.0	+ 2.0	+ 1.0	0.0
103	+ 1.5			+ 5.0		
104	+ 3.0	0.0	+ 1.5	+ 3.5	+ 3.0	— 2.0
105	+ 5.0	+ 1.5	+ 1.0	+ 3.5	+ 2.0	0.0
107	+ 1.0	— .5	— 1.5	+ 9.0	— 4.0	— 3.0
108	+ 2.0	+ 5.0	+ 2.0	+ 3.0	+ 3.0	+ 2.0
109		+ 2.0		+ 1.0		
110				+ 1.0		
111	+ 4.0	0.0	+ 2.0			
112	+ 2.0	— 4.0	0.0	— .5	+ 4.0	0.0
113	— 3.0	+ 2.5	— 1.0	+ 5.0	— 3.0	+ 1.0
114		0.0	+ 4.0		+ 3.0	+ 5.0
115	+ 3.0	0.0	— .5	+ .5	— 2.0	+ 3.0
116	+ 3.5	— 4.0	+ 6.5	+ 2.0	— 1.0	— 1.0
119	+ 6.0			0.0		0.0
120	— 6.5	— 5.0	— 3.0	— 1.0		
125	— 3.5	+ 3.0	+ 2.0	0.0		
127	+ 1.0	— 2.5	+ 6.5	— .5	+ 1.0	+ 1.0
128	— 1.0	— 4.0	0.0	+ 3.5	+ 3.0	+ 1.0
129	— 1.0	+ 6.0	— 1.5	0.0	— 2.0	— 1.0
130	0.0	0.0	— 7.5	+ 5.0	+ 2.0	— 2.0
131	+ 1.0			+ 8.5		
132	+ 6.0	+ 8.0	— 2.0	+ 3.0	— 3.0	— 1.0
133	+ 5.0	— 1.0	+ 1.0	0.0	— 2.0	+ 2.0
134		+ 3.0	— 1.0		+ 1.0	+ 5.0
135						

TABLE XXXIX.

No.	Dictation. 1st.	2nd.	3rd.	4th.	Total.
62	+ 1.0	+ 5.0	— 11.0		— 5.0
63	+ 1.0	+ 1.0	0.0	+ 12.0	+ 14.0
64	+ 4.0	+ 6.0	— 1.0	— 4.0	+ 5.0
65	0.0	— 1.0	+ 4.0	0.0	+ 3.0
66	+ 2.0	+ 2.0	+ 6.0	+ 7.0	+ 17.0
67	0.0	+ 2.0	+ 3.0	— 1.0	+ 4.0
68	— 3.0	0.0	— 6.0	— 8.0	— 17.0
69	+ 1.0	— 1.0	— 1.0	+ 1.0	0.0
70	0.0	— 3.0	+ 10.0	+ 2.0	+ 9.0
71	— 6.0	+ 1.0	— 4.0	— 2.0	— 11.0
72	0.0	— 1.0	+ 3.0	+ 1.0	+ 3.0

No.	Dictation. 1st.	2nd.	3rd.	4th.	Total.
73	-4.0	-3.0	+6.0	-4.0	-5.0
74	-2.0	-1.0	+1.0		-2.0
75	-1.0	+4.0	0.0	+1.0	+4.0
80	+5.0	+3.0	+3.0	0.0	+11.0
81	+1.0	0.0	+2.0	+1.0	+4.0
82	+2.0	+1.0	+1.0		+4.0
83	+3.0	+1.0	+2.0	-2.0	+4.0
84	0.0	0.0	+12.0	+2.0	+14.0
85	+2.0	+3.0	+9.0	-2.0	+12.0
87	-1.0	+1.0	-7.0	-4.0	-11.0
88	0.0	0.0	+3.0	+5.0	+8.0
89	0.0	+1.0	+3.0	+5.0	+9.0
90	-4.0	+4.0	-6.0	-8.0	-14.0
91	+2.0	-3.0	-3.0	+3.0	-1.0
93	0.0	+5.0	-4.0	+9.0	+10.0
123	+1.0	+5.0	-8.0	+1.0	-1.0
124	-2.0	+3.0	-14.0	0.0	-13.0

TABLE XL.

No.	Pulse.	Temperature.	Wt. Test.	Block Test.	Maze. Amt.	Maze. Touches.
62	-20.0	-2.4	-9.9	0.0	-3.0	-6.0
63	-18.0	-1.2	-13.9	0.0	0.0	+21.0
64	+22.0	+1.2	+7.7	-3.0	-2.0	+4.0
65	+21.0	-0.2	+7.7	+12.5	+0.5	+2.0
66	-32.0	+0.6	-4.1	+3.5	-2.0	+9.0
67	-9.0	-0.4	+4.7	-3.0	-9.5	+33.0
69	-13.0	+2.8	-4.7	+7.5	-2.5	+1.0
70	+43.0	+0.4	-5.3	+17.0	-12.0	+43.0
71			-1.5	-6.0	+5.5	-24.0
72	+13.0	-2.2	-6.8	+12.0	+4.0	+3.0
73	-7.0	-3.0	+4.7	-10.5	+2.5	-10.0
74	-20.0	-2.8	-13.3	+1.0		
75	0.0	-1.2	-6.4	-1.5	-3.0	-4.0
77	-3.0	-0.8	-9.9	-10.5	0.0	-13.0
80	-10.0	-2.0	+2.5	+4.5	+5.0	-26.0
81	+10.0	-0.8	-1.6	+1.0	-3.5	-8.0
82	+5.0	-3.2	0.0	+1.0	-8.0	-3.0
83	+9.0	-1.6	+2.5	+0.5	+10.5	-60.0
84	-1.0	-2.2	-11.5	+9.0	-7.0	+26.0
85	-14.0	-1.6	-4.8	+3.0	-4.5	+27.0
87	-25.0	+2.2	-12.4	+9.5	+9.0	-11.0
88	+1.0	-0.6	+1.5	-2.0	-2.0	+2.0
89	-17.0	-0.6	+5.6	-16.0	-1.5	+15.0
90	-21.0	-1.2	+17.6	-18.0	0.0	+5.0
91	-8.0	-1.2	-13.3	+3.0	-4.0	+6.0
93	-15.0	+1.4		0.0	+11.0	-29.0
123	-4.0	-1.8	-4.5	+1.5	-10.5	+33.0
124	-12.0	-0.2	-0.9	+5.0	0.0	+16.0
127	-6.0	-0.2	+1.0	-1.0	-9.0	+42.0

TABLE XLI.

No.	Intelligence.	Memory.	Maturity.
62	+ 0.5	— 3.5	— 1.9
63	0.0	+ 5.0	— 1.7
64	+ 0.3	+ 0.5	+ 3.7
65	+ 4.6	— 0.5	+ 4.3
66	+ 4.8	+ 8.5	+ 2.9
67	0.0	+ 4.0	+ 3.2
68	+ 2.8	— 8.5	— 1.0
69	+ 0.7	0.0	+ 6.5
70	+ 2.2	+ 9.0	+ 6.8
71	0.0	— 6.5	— 3.3
72	— 1.0	— 0.5	+ 3.4
73	— 0.3	0.0	+ 5.9
74	+ 3.6	— 0.5	+ 4.6
75	+ 4.2	+ 1.0	— 0.8
77	— 1.7	— 1.0	— 2.6
80	+ 2.6	+ 5.5	+ 0.6
81	— 2.1	+ 2.0	+ 3.3
82	+ 1.2	+ 5.0	+ 6.2
83	+ 1.8	+ 1.5	+ 3.6
84	+ 3.8	+ 8.0	+ 2.1
85	+ 2.3	+ 8.0	+ 3.0
87	+ 4.0	— 3.5	+ 2.8
88	+ 0.1	+ 8.0	+ 8.6
89	+ 1.8	+ 5.0	+ 7.9
90	+ 2.8	— 8.5	+ 3.9
91	+ 1.1	— 1.0	+ 0.6
93	+ 1.3	+ 5.0	— 0.7
96	+ 0.1		+ 12.5
97	— 0.1		— 1.5
98	+ 0.02		+ 4.3
100	+ 5.0		
101	+ 2.7		+ 8.3
103	+ 3.2		+ 2.5
104	+ 2.0		+ 5.0
105	+ 2.7		+ 3.6
107	+ 2.0		— 0.3
108	+ 3.0		+ 2.3
109	+ 1.5		
110	+ 1.0		— 5.0
111	+ 2.0		0.0
112	— 0.6		— 0.6
113	+ 0.8		+ 4.6
114	+ 2.0		+ 12.3
115	+ 0.7		+ 1.3
116	+ 2.0		+ 4.3
119	+ 3.0		+ 2.6
120	— 3.8		— 15.0
125	+ 0.3		+ 2.5
127	+ 1.1		+ 2.2

No.	Intelligence.	Memory.	Maturity.
128	— 0.3		† 2.5
129	† 1.1		+ 6.6
130	— 0.6		+ 12.0
131	+ 4.7		
133	+ 1.2		+ 3.6
134	+ 1.0		+ 4.3

§ 19. *Keys Used in Marking the Tests*

## Opposite 1

bad	good (r).
inside	outside (r), out (.5), outdoors (.5).
slow	quick (r), fast (r), slowly (.5).
short	tall (r), big (.5).
little	big (r), tall (.5).
soft	loud (r), hard (r), rough (.5).
black	white (r).
dark	light (r), daylight (r).
sad	happy (r), glad (r).
true	false (r), falsehood (.5).
dislike	like (r), love (r).
poor	rich (r).
well	sick (r), ill (r), badly (r).
sorry	glad (r), happy (r).
thick	thin (r).
full	empty (r).
peace	war (r).
few	many (r), a lot (r).
below	above (r), over (r), on top (r).
enemy	friend (r), companion (r).

## Opposite 2

good	bad (r).
outside	inside (r), in (.5), indoors (.5).
quick	slow (r), lazy (.5), slowly (.5).
tall	short (r), little (.5), low (.5).
big	little (r), short (.5).

loud	soft (r), low (r), whisper (.5).
white	black (r).
light	dark (r).
happy	sad (r), sorry (r), sorrow (.5).
false	true (r), right (.5), truth (.5).
like	different (r), dislike (r), unlike (r), hate (r).
rich	poor (r).
sick	well (r), healthy (r).
glad	sorry (r), mad (r).
thin	thick (r), broad (.5).
empty	full (r), filled (r).
war	peace (r).
many	few (r), none (r).
above	below (r), under (r).
friend	enemy (r).

## Part-Whole Test

door	anything that usually has a door (r).
pillow	couch (r), bed (r), sofa (x).
letter	word (r), alphabet (r), envelope (x).
leaf	tree (r), plant (r), book (r).
button	anything usually having buttons.
nose	face (r), head (r), cheek (x).
cover	book (r), bed (r), kettle (r).
page	book (r).
engine	train (r), car (r).
glass	window (r), door (r), tumbler (x).

## Genus-Species Test

book	name of any book or specific class name.
tree	specific tree or class.
room	name of any room.
toy	anything used to play with, play (x).
name	any particular name.
dish	any particular dish.
boat	any kind of boat.
game	any game, toy (x).
plant	any particular plant.
fish	any kind of fish.





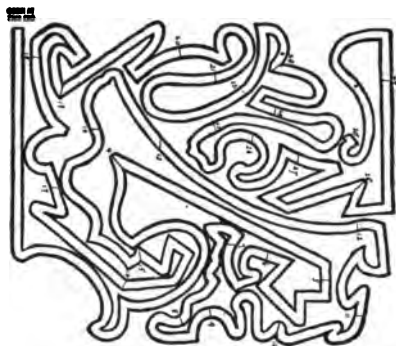


FIG. 33. Maze, showing the units of amount which were regarded as equal. These were determined by experiment.

### § 20. *Characteristics of the Defectives Tested*

1. Girl—overgrown—poorly nourished—very nervous.
6. Girl—flighty—irritable—spoiled—talked poorly.
7. Girl—sister of 6—timid—clumsy—used only single syllables.
9. Girl—large head—vicious expression.
10. Girl—overgrown—rather small head—stupid.
12. Girl—lame—excessively nervous—talks all the time.
13. Girl—appears all right—rather slow.
14. Girl—appears all right—very sensible.
19. Girl—little attention—afraid of everything.
23. Girl—appears all right.
24. Girl—stupid expression—enlarged tonsils.
27. Girl—very large head—wandering expression.
29. Girl—epileptic—one hand shrunken.
32. Girl—appears all right but very timid.
36. Girl—very small head—expression vacant.
39. Girl—small head—rather stupid in appearance.
42. Boy—giggles—rather shifty eyes—otherwise appears all right.
43. Girl—very bad—eyes unsteady—glassy—talks poorly—walks clumsily.
44. Girl—too stout—epileptic—expression all right.
45. Boy—one side of face affected, also hands and feet—talks poorly—eyes queer.
46. Boy—very small—head small and biassed—eyes unsteady—peculiar looking.
47. Boy—rather moody—bright sensible face—seemingly all right all through.
49. Boy—legs paralyzed—talked sensibly—wants to go to work.

50. Girl—eyes unsteady—staring—mouth open—walks poorly.
51. Boy—just a typical bad boy—comes from reform school—bright.
53. Boy—rather silly—giggles—walks peculiarly.
54. Boy—giggles a little—eyebrows raised—otherwise appears all right.
55. Boy—eyes a little crossed—seemingly all right and bright looking.
56. Boy—feet paralyzed—almost blind—talks poorly.
58. Girl—epileptic—very slow—drags feet—very affectionate.
59. Boy—silly looking—cross-eyed—walks clumsily—mouth open.
60. Boy—very bad—misshapen head, mouth and ears—walks clumsily—talks much.
61. Girl—rather peculiar—nothing special.
62. Boy—silly looking—mouth open.
63. Boy—mouth breather.
64. Girl—slow and timid.
65. Girl—mind sketchy—cross-eyed.
66. Boy—vacant expression.
67. Boy—very slow—mouth open—left-handed—bright eyes.
69. Girl—sensible looking—eyes peculiar—tires easily.
70. Boy—very slow—old face—very helpful.
71. Boy—nothing special—rather bright looking.
72. Boy—mouth open—rather repulsive face.
73. Boy—mouth open—head stoops forward.
74. Boy—intelligent looking—lazy.
75. Boy—nothing special.
76. Boy—face misshapen—left-handed—can't write—slow.
77. Boy—*very* deaf—throat obstructed—conscious of defects—bright eyes.
78. Boy—mouth open—dribbled—sleepy eyes.
79. Boy—sharp face—head stoops.
80. Boy—face misshapen—very intelligent and appears all right.
81. Girl—bright, refined child—intelligent—seemingly nothing the matter.
82. Boy—bright face—firm chin—seems all right.
83. Girl—heavy looking.
84. Boy—wears glasses—left-handed—talks rather peculiarly.
85. Boy—generally shrunken appearance—bright expression—cross-eyed—mouth open.
86. Boy—rather heavy—mischievous.
87. Boy—nothing particular—very bass voice.
88. Girl—nothing particular.

90. Girl—heavy—stout—smiles vacantly—very slow.
91. Boy—rather wizened—nothing particular.
92. Girl—tired looking.
94. Boy—puffy face—rather angelic-looking—aggressive.
127. Girl—bright, nervous—eyes rather unsteady.
139. Boy—rather repulsive—eyes staring—mouth open—waddles.
140. Boy—rather stupid—eyes unsteady.
141. Boy—cross-eyed but looks bright.
142. Girl—eyes staring, otherwise looks all right.
143. Boy—rather sleepy looking—cries readily—lanky.
- 144-5. Boys—twins—seemingly all right—both bright and happy.
146. Boy—vacant expression—misshapen ears.
147. Boy—does not talk—eyes unsteady—walks unsteadily.
148. Boy—very repulsive—eyes staring—mouth open—talks poorly  
—hands and feet affected.
149. Girl—epileptic—seems all right but slow.
150. Boy—very nervous and uneasy—peculiar motion of head when  
talking—talks much.
151. Boy—one side paralyzed—staring eyes—mouth open.
152. Boy—bright face—talks indistinctly—walks with difficulty—  
hands affected.
153. Girl—quick blinking—talks incessantly and incoherently—  
drags feet slightly.
154. Girl—lanky—talks indistinctly—hands and feet slightly af-  
fected.
156. Girl—does not talk—mouth open—walks poorly.
157. Girl—seems all right—inclined to be moody.





